2007 Annual Report

Pallid Sturgeon Population Assessment and Associated Fish Community Monitoring for the Missouri River: Segment 11

Prepared for the U.S. Army Corps of Engineers – Missouri River Recovery Program
By:

Darby J. Niswonger, Paul T. Horner, and Vincent H. Travnichek

Missouri Department of Conservation
Missouri River Field Station
15302 LIV 2386
Chillicothe MO 64601

April 2008

EXECUTIVE SUMMARY

The Missouri Department of Conservation began its third year within the Pallid Sturgeon Population Assessment Program at the beginning of the 2007 sampling season. Sampling was successfully completed in the required bends (N = 3) during the 2007 sturgeon and fish community seasons. One hatchery stocked pallid sturgeon was captured in segment 11 during the 2007 sampling season. This pallid sturgeon was the first recorded capture in the Kansas River since 1952. The fish was captured at RM 12 in a standard gillnet 16 April 2007. The pallid sturgeon was from the 2005 year class that was stocked at Parkville, MO (Missouri River RM 377.5) in August of 2006. The fish was at large for eight months and traveled 22 river miles (10 miles down the Missouri River and 12 miles up the Kansas River). The fork length at capture was 329 mm, and weight was 104 g. At the time of stocking, fork length was 283 mm and it weighed 81 g. This pallid sturgeon grew an average of 0.202 mm and 0.101 g per day after being stocked in the river. The relative condition factor (Kn) of the fish was 0.881. This fish retained its PIT tag, thus 100% retention was found. No young of the year sturgeon were captured in the Kansas River in 2007.

A total of 532 shovelnose sturgeon (fork length = 201 to 764 mm) was captured with gill nets (N = 379), 1-inch trammel nets (N = 120), and otter trawls (N = 33). Most shovelnose sturgeon were captured within the channel border and were associated with open water areas along bank lines. Two pallid sturgeon X shovelnose sturgeon hybrids were captured with gillnets. Character index values were calculated for only one of the hybrid sturgeon (0.076). The two fish were deemed hybrids by physical characteristics (elongated snout, semi-scaled belly, and insertion position / smaller size of inner barbels).

Speckled chubs (N = 7) were the only *Macrhybopsis* species captured with standard gear in segment 11. Otter trawls deployed in channel border mesohabitats within the channel-cross over, inside and outside bends captured all speckled chubs. All sand shiners (N = 191) were captured with otter trawls and mini-fyke nets, with most fish captured on sand bars and along the bank line using mini-fyke nets. Gill nets and trammel nets captured 25 blue suckers in channel border, pool, and island tip mesohabitats. Two sauger were captured within the channel border along inside bends with 1-inch trammel nets, and one individual was collected in a gill net. A

total of 3,254 fish representing 45 species was captured in segment 11 during the 2007 sampling season.

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Introduction

Pallid sturgeon *Scaphirhynchus albus* are native throughout the Missouri River and to the middle and lower Mississippi River. Population levels of this species have declined over the past century, and declines have been attributed to anthropogenic influences including habitat loss, blocked migration routes, and an altered hydrograph and water temperature regime (USFWS 1993). As a result, this species was listed under the Endangered Species Act in 1990. The Pallid Sturgeon Recovery Plan (USFWS 1993) identified six priority pallid sturgeon recovery management areas (RPMAs), four of which lie within the Missouri River. Further, this document provided an outline that proposed to: 1) protect and restore pallid sturgeon populations, individuals, and their habitats; 2) conduct research necessary for survival and recovery of pallid sturgeon; 3) develop and implement a pallid sturgeon captive propagation program, and; 4) coordinate and implement conservation and recovery of sturgeon species.

In 2000, the U. S. Fish and Wildlife Service (USFWS) issued a Biological Opinion on the Operation of the Missouri River Main Stem Reservoir System Operation and Maintenance of the Missouri River Bank Stabilization and Navigation Project and Operation of the Kansas River Reservoir System (Bi-Op; USFWS 2000) to the U. S. Army Corps of Engineers (USACE). This document recommended: 1) that the flow regime of the Missouri River mimic a more natural hydrograph, 2) an increase in propagation and population augmentation efforts, and 3) the development of a pallid sturgeon population assessment program (PSPAP). As the federal entity responsible for water management within the Missouri and Kansas River systems, the USACE has an obligation under the Endangered Species Act to conserve the pallid sturgeon. To comply with the Bi-Op, the USACE has proposed to operate Gavins Point Dam in a manner to create a more natural hydrograph, has funded hatchery improvements and expansions, has funded the PSPAP, and facilitated the development of the Pallid Sturgeon Population Assessment Team (Team).

The initial stocking of pallid sturgeon in 1994 consisted of about 6,500 fish from the 1992 year class that were stocked into RPMAs 4 (Missouri River below Gavins Point Dam) and 5 (middle Mississippi River; USFWS 2005). Subsequent stockings in 1997, 1998, and 2001 through 2007 in all six RPMAs have resulted in approximately 930,900 pallid sturgeon

being stocked into the Missouri, Mississippi, and Yellowstone Rivers (Krentz and Wilson 2008). The total number of pallid sturgeon stocked per year has increased from an average of about 4,000 fish per year prior to 2000 to an average of nearly 39,000 fish per year from 2001-2006. In 2007, there was a total of 577,936 pallid sturgeon stocked into the Yellowstone and Missouri Rivers, with most (529,152) of those stocked in RPMA 2. Most pallid sturgeon were stocked as fingerlings (age-0), advanced fingerlings, and yearlings (age-1), though some fish age-2 to age-5 were released as well. There has been no pallid sturgeon stocked into segment 11, the Kansas River.

Implementation of the PSPAP began in 2001 when the USFWS-Columbia Fishery Resource Office (USFWS-CFRO) began monitoring under PSPAP guidelines and Nebraska Game and Parks Commission (NGPC) conducted an evaluation of benthic trawls. The USACE hired a fishery biologist to coordinate the PSPAP in 2002, and the USFWS-CFRO and NGPC continued monitoring in segments 9, 13, and 14 in the lower Missouri River. Standardized sampling above Gavins Point Dam (segments 5 and 6) occurred for the first time in 2003 by the USFWS-Great Plains Fish and Wildlife Management Assistance Office. During 2004, monitoring continued in segments 5, 6, 8, 9, 13, and 14, and an independent science review was conducted to determine the ability of the PSPAP to address its objectives. Beginning with the 2005 fish community season, the Team added USFWS-Missouri River Fish and Wildlife Management Assistance Office (segment 4), South Dakota Department of Game Fish and Parks (segment 7), and Missouri Department of Conservation (segment 10) field crews that completed implementation of the PSPAP from segments 4 through 14 on the Missouri River. In 2006, the Team added the Montana Department of Fish, Wildlife, and Parks field crew and the Missouri Department of Conservation began sampling segment 11 (the Kansas River) to complete implementation of the PSPAP from segment 1 through 14.

The objectives of the PSPAP are as follows: 1) document annual results and long-term trends in pallid sturgeon population abundance and geographic distribution throughout the Missouri River System; 2) document annual results and long-term trends of habitat use of wild pallid sturgeon and hatchery stocked pallid sturgeon by season and life stage; 3) document population structure and dynamics of pallid sturgeon in the Missouri River System; 4) evaluate annual results and long-term trends in native target species population abundance and geographic distribution throughout the Missouri River system; 5) document

annual results and long-term trends of habitat usage of the native target species by season and life stage; and 6) document annual results and long-term trends of all non-target species population abundance and geographic distribution throughout the Missouri River system, where sample size is greater than 50 individuals. Results from the PSPAP will serve a valuable role in the collection and assembly of biological information to facilitate recovery of pallid sturgeon.

Study Area

The Missouri River was divided into segments for the PSPAP based on changes in physical attributes of the river (e.g., tributary influence, geology, turbidity, degrading or aggrading stream bed, etc.). These segments were numbered 1 through 14 in a downstream direction and included all riverine portions of the Missouri River from Fort Peck Dam to the confluence. The study area is composed of four distinct groups of segments. Segments 1 through 4 lie in RPMA 2 and includes the 203.5 river miles from Fort Peck Dam downstream to the headwaters of Lake Sakakawea, North Dakota. Segments 5 and 6, that lie in RPMA 3, consists of the 55 river miles from Fort Randall Dam, South Dakota, downstream to the headwaters of Lewis and Clark Lake, Nebraska-South Dakota. Segment 7 extends from Gavins Point Dam downstream 61 miles to Lower Ponca Bend, Nebraska-Iowa, and is the only segment below Gavins Point Dam that is not channelized. Segments 8 through 14 include the entire channelized portion (750 miles) of the Missouri River that extends from Lower Ponca Bend to the confluence with the Mississippi River. The Kansas River, from Lawrence, KS to the mouth (40.0 miles), was given its own segment designation (segment 11) because this tributary was addressed by the 2000 Bi-Op as a high priority management area for pallid sturgeon. Segments 1 through 4 and 5 through 14 compose the "upper sampling universe" and "lower sampling universe", respectively. The upper sampling universe is characterized by several impoundment and tailwater areas interdispersed by a meandering, often braided channel that lacks navigation structures and deep pools. The lower sampling universe is channelized, has revetted banks, and deep scour pools and sand bars that are associated with a variety navigation structures. Segments 5 through 7 of the lower sampling universe are influenced by reservoirs and are unchannelized, while segments 8 through 14 comprise the channelized portion of the Missouri River. This document reports activities during the 2007 sampling season specific to segment 11.

Segment 11, the Kansas River, is a large tributary within RPMA 4 and is designated as the lower portion of the river, from Lawrence, Kansas (river mile 40) to the mouth. However, the river from Lawrence to 21.0 is not consistently accessible by boat. Therefore, only the areas of the river which can be consistently sampled are given bend designations. This consists of six numbered river bends between river mile 21.0, located 6.3 miles above the Johnson County Weir (weir), Kansas and the confluence of the Kansas River

(RM 0). River bends in this segment ranged from 1.7 to 6.3 miles in length with a mean bend length of 3.5 miles. The Kansas River above the weir is unchannelized, characterized by a braided system with no defined channel. There is a notable amount of sand dredging, but the river is mostly shallow (1 – 3 meters), restricting sampling to high flow (≥ 7500 cuffs) events. The Kansas River below the weir is channelized, through the industrial area of Kansas City to the mouth, though no channel is maintained for navigation traffic. River banks are lined with rip-rap along the outside and inside bends of the river. Structures in this segment are few, but include very small wing dikes in some areas. There are various large boulder areas, refuse concrete slabs, degraded areas with undercut banks, and natural island and side chute habitats. The river is relatively shallow, restricting sampling only at times following a rain event, or when influence by the mainstem Missouri while experiencing high flows (> 45,000 cfs).

Methods

All sampling was conducted in accordance with the guidelines established by the Pallid Sturgeon Assessment Team as outlined in the Pallid Sturgeon Population Assessment Program and Missouri River Standard Operating Procedures for Sampling and Data Collection (Drobish 2008a, b). Data collected by each PSPAP field office were entered via double-blind entry into a single database housed and managed by the Missouri Department of Conservation. Data were subsequently distributed to each participating office according to reporting responsibilities: segment 1 through 3 – Montana Fish, Wildlife and Parks-Fort Peck, MT; segment 4 – USFWS-Bismark, ND; segments 5 and 6 – USFWS-Pierre, SD; segment 7 – South Dakota Department of Game, Fish, and Parks-Yankton, SD; segments 8 and 9 – Nebraska Game and Parks Commission-Lincoln, NE; Segments 10 and 11 – Missouri Department of Conservation-Chillicothe, MO; segments 13 and 14 – USFWS-Columbia, MO.

Two distinct sampling seasons have been established to assess sturgeon species and the associated fish community. The sturgeon sampling season began 01 November 2006 or when water temperatures dropped below 12.8ºC (55ºF) and continued through 30 June 2007. The fish community season began 01 July 2007 and continued through 31 October 2007. The Missouri Department of Conservation sampled both seasons during 2007, thus, data from both sampling seasons are included in this report. Data from 2005 and 2006 are also included in this report for annual comparisons. During these seasons, standard gear types included experimental gill nets, 1-inch trammel nets, 16-foot otter trawls, and mini-fyke nets (Appendix C). Gill nets were the only sampling gear that would have been used during the sturgeon season until 01 March 2007. The beginning of this season was further divided into a pre-winter and spring gill netting period. Pre-winter gill netting was conducted from the onset of sturgeon season until 15 January. Spring gill netting efforts would have began 16 January and continued until water temperatures reached 12.8ºC (55ºF). Trammel netting and trawl efforts began 01 March 2007 and were conducted through 30 June.

Fish community season began 01 July 2007 and continued through 31 October 2007. Although this season utilized gears that capture sturgeon species (i.e., 1-inch trammel nets and otter trawls), particularly small (i.e., juvenile or young) sturgeons, there was an

additional emphasis placed on assessing the associated fish community. Standard gear types during the fish community season included 1-inch trammel nets, 16-foot otter trawls and mini-fyke nets (see Sampling Gear section for gear specifications). These gears were deployed throughout the season with efforts made to spatially and temporally distribute sampling across the ten randomly selected bends within the segment.

In addition to pallid sturgeon, the Team identified members of the associated fish community that were of particular interest due to their ecology (e.g., obligate big river species, benthic species, etc.). These species were identified as "species of interest" and include: shovelnose sturgeon *Scaphirhynchus platorynchus*, blue sucker *Cycleptus elongatus*, sauger *Sander canadensis*, sturgeon chub *Macrhybopsis gelida*, sicklefin chub *M. meeki*, speckled chub *M. aestivalis*, western silvery minnow *Hybognathus argyritis*, plains minnow *H. placitus*, and sand shiner *Notropis stramineus*. All captured fish were identified to species when practicable and measured for total length (TL) except sturgeon that were measured for fork length (FL) and paddlefish *Polyodon spathula* that were measured for eye-fork length. Shovelnose sturgeon, blue suckers, and sauger were weighed to the nearest 1 g.

When a pallid sturgeon was captured, several meristic and morphometric measurements were recorded to determine the character index (CI) score for each fish (Sheehan et al. 1999). Measurements required to calculate CI-score included: head length, interrostral length, length of each barbel, mouth to inner barbel length, and mouth width (see Sheehan et al. (1999) for descriptions of each measurement). The length from the fish's snout to the anterior midline of the mouth was also recorded. Meristics included number of dorsal and anal fin rays, including rudimentary rays. Ranges of CI-scores for pallid, shovelnose X pallid hybrids, and shovelnose have been defined as -1.48 to -0.09, -0.45 to 0.51, and 0.37 to 1.33, respectively. In general, CI-scores were only calculated for suspected wild pallid sturgeon or hybrid individuals.

In addition to meristic and morphometric measurements, all pallid sturgeon were examined for elastomer (color, orientation, and side of fish), coded wire (CWT), and passive integrated transponder (PIT) tags. If no tags were present, a PIT tag was implanted at the base of the dorsal fin and a 1 cm^2 piece of tissue was removed from the trailing edge of the caudal fin for genetic analysis. Before each pallid sturgeon was released, voucher pictures

were taken from a lateral and ventral view of the fish with a summary of capture information (e.g., PIT tag number, location, date, CI-score, etc.).

Sampling Site Selection and Description

Site selection.

Beginning with the 2007 sampling season, twenty-five percent of bends from each segment were randomly selected as bends to be sampled within each sampling season. Segment 11 has a total of six named river bends, and three of these were randomly selected to be sampled during each sampling season (Appendix I). Within each randomly selected river bend in segment 11, sampling locations were chosen based on the availability of standard habitats for each gear type. Due to varying lengths of each bend, proportionate sampling was implemented for gears targeting sturgeon in 2007, to gain a better representative sample for each bend. This averages one subsample per 0.3 miles of river in the bend. Additional subsamples were deployed for otter trawl and trammel nets depending upon the length of the bend. A minimum of two subsamples were collected within each standard mesohabitat within each available macrohabitat. Within each macrohabitat, subsamples were proportionately spaced throughout the bend among habitat features. For example, if six subsamples were conducted in the inside bend within the influence of wing dikes and there were 12 wing dikes, approximately every other wing dike would be sampled. For most gear types, at least two subsamples were conducted in the channel crossover and the inside- and outside-bends were equally sampled (8 to 16 subsamples per bend depending upon bend length).

Site description.

Sampling sites were described using a three-tiered (macro-, meso-, and microhabitat) classification system that was based on the Missouri River Benthic Fish Study (Berry and Young 2001). Within this habitat designation system, by definition each river bend contained the following three continuous macrohabitats: main channel crossover (CHXO), inside bend (ISB), and outside bend (OSB). The channel crossover was the area where the thalweg crossed from one concave side of the river to the other. The inside bend was the convex side of the river and the outside bend was the concave side of the river.

Classifications for discrete macrohabitats that may not be present in every bend included: braided channel (BRAD), tributary confluence (CONF), dendritic channel (DEND), deranged channel (DRNG), large secondary channel-connected (SCCL), small secondary channel-connected (SCCS), non-connected secondary channel (SCN), large tributary mouth (TRML) and small tributary mouth (TRMS). Braided channels were areas with multiple channels and an unidentifiable main channel. Tributary confluences were areas where tributaries influenced physical features (e.g., temperature, turbidity, sand bars, etc.) of the Kansas River for up to one bend in length downstream from the tributary mouth. Dendritic and deranged channels were transitions from a meandering channel to a tree-like pattern of multiple channels and vice versa, respectively. Large, connected secondary channels were channels that carried less water than the main channel, were open on both ends, and had flowing water with water depths greater than 1.2 m. Small, connected secondary channels were defined similarly to SCCL, but water depths did not exceed 1.2 meters. Non-connected secondary channels were channels that were blocked on one end. Large tributary mouths were areas within tributaries, with an annual discharge that exceeded 20 m^3/s and extended 300-m upstream from the confluence with the main river. Small tributary mouths were areas within 300 m of the confluence with the main river, were greater than 6 m in width, and had an annual discharge less than 20 m^3/s.

Mesohabitats within each macrohabitat included: sand bar (BARS), main channel border (CHNB), dam tailwater (DTWT), island tip (ITIP), pool (POOL), and thalweg (TLWG). Sand bars were defined as areas less than 1.2 meters deep at the aquatic-terrestrial interface. Channel border habitats extend from the 1.2-m depth contour to the edge or toe of the thalweg. Island tips were areas immediately downstream from islands where water depths were greater than 1.2 meters. Pools were areas immediately downstream from obstructions (rock dikes, sand bars, bridge pilings) where there was a scour greater than 1.2-m in depth regardless of water velocity. The thalweg was defined as the area between the channel borders that conveyed the majority of the flow.

Microhabitats were identified using a six-digit numeric code. The first three digits of this code described the general habitat structure (e.g., kicker dike, wing dike, sand bar, etc.) with which the gear deployment was associated. The last three digits described the exact location of the gear in relation to this structure (e.g., wing-dike pool, open water inside eddy,

sand-bar crown, etc.). For complete definitions of each microhabitat type see Drobish (2008a,b).

The Team has established standard habitats (macro- and meso-) for groups of segments (1 through 4, 5 through 7, and 8 through 14) in which each gear type could be deployed (Drobish 2007a). For segment 11, standard macrohabitats for 1-inch trammel nets included: CHXO, CONF, ISB, OSB, and SCCL. Within these macrohabitats, only CHNB and ITIP mesohabitats were standard. Otter trawls were standard in these same macro- and mesohabitats habitats as well as in TRML macrohabitats. Standard macrohabitats for mini-fyke nets included: CHXO, CONF, ISB, OSB, SCCL SCCS, SCN, TRML, and TRMS. The only standard mesohabitat for this gear type was BARS.

Sampling Gear

Standard gill nets were set primarily parallel with flow downstream from structures (rock dikes) and along the channel border (channel sand bars). Gill nets were anchored on the upstream and downstream end to ensure complete extension during the sampling period. A line and buoy were attached to both ends to mark the net and for retrieval. In segment 11 during the 2007 sturgeon season, gill nets were used as standard gear in CHXO, ISB, OSB and SCCL macrohabitats and CHNB, ITIP, and POOL mesohabitats. The standard gill nets were 30.5 m (100 ft.) in length, 2.4 m (8 ft.) deep, constructed from multifilament nylon mesh and contained four panels. Each panel was 7.6 m (25 ft.) with mesh size of 38.1 mm (1 in.) Panel 1, 50.8mm (2 in.) Panel 2, 76.2 mm (3.0 in.) Panel 3, and 101.6 mm (4.0 in.) Panel 4. Panels repeat (5 through 8) in double length nets with 38.1mm, 50.8mm, 76.2mm, 101.6mm mesh sizes in panels 5, 6, 7, and 8, respectively. All nets had a 13-mm braided polyfoam-core float line and a 7.1-mm diameter, 22.7 kg lead line. Standard effort is calculated with a 30.5 m (100 ft.) net (1 net night). Sets made with 61 m (200 ft.) nets counted as double effort (2 net nights). The first panel (1, 4, or 8) deployed out of the boat for a set site was selected randomly and recorded. Gill nets were set overnight for a maximum of 24 hours.

Trammel nets were deployed off the bow of the boat by throwing a buoy attached to a 10-m line and motoring in reverse perpendicular to the flow toward the bank. A second buoy and line on the other end of the net remained on board and was held without tension as the

net drifted downstream perpendicular to flow. Standard drifts ranged from a minimum distance of 75 m to a maximum distance of 300 m. In segment 11 during the 2007 fish community and sturgeon seasons, trammel nets were used as standard gear in CHXO, ISB, OSB, and SCCL macrohabitats and CHNB and ITIP mesohabitats. Trammel nets (i.e., 1-inch trammel nets) were 38.1 m (125 ft.) in length and constructed from multifilament nylon mesh. The inner wall was 25.4 mm (1 in.) bar mesh (#139 twine) that was 2.4-m deep (8 ft) and the outer wall was 203-mm (8 in.) bar mesh (# 9 twine) that was 1.8 m (6 ft.) in depth. All nets had a 13-mm braided polyfoam-core float line and a 7.1-mm diameter, 22.7 kg lead line.

Otter trawls were deployed from the stern of a custom-designed, inboard jet trawl boat while traveling in a downstream direction. A buoy and line were attached to the cod end of the trawl for retrieval if a snag was encountered. Common sampling locations included open water areas below wing dikes and along channel sand bars. The towing warp consisted of 13-mm low-stretch nylon line with a 13.7-m bridle. In segment 11 during the 2007 fish community and sturgeon seasons, otter trawls were used as standard gear in CHXO, ISB, OSB and SCCL macrohabitats and CHNB and ITIP mesohabitats. Standard trawl hauls ranged from a minimum distance of 75 m to a maximum distance of 300 m. All otter trawls were a custom-designed skate balloon otter trawl with a 4.9-m (16 ft.) headrope, 0.9 m mouth height, and overall length of 7.6 m. Paired wooden otter doors were 762 mm (30 in.) x 381 mm (15 in.).

Mini-fyke nets were set in shallow, slack water areas with the lead extending perpendicular to the river bank or sand bar. The lead length was adjusted so the top of the cab would rise above the water surface to minimize turtle mortalities. In areas with moderate flow, nets were positioned at a slight downstream angle with weights attached to the upstream side of the cab to prevent the net from overturning. The perpendicular distance measured from the midpoint of the cab to the bank was recorded. Nets were generally set in the afternoon and left overnight with a maximum soak time of 24 hours. In segment 11 during the 2007 fish community season, mini-fyke nets were set as a standard gear in CHXO, ISB, OSB, SCCS, and TRMS macrohabitats and BARS mesohabitats. Mini-fyke nets were constructed from 3-mm ace mesh with two rectangular frames 1.2 m wide and 0.6 m high to

form the cab. The body of the net was constructed with two 0.6 m steel hoops, with a single, 51-mm throat. The lead was 4.5-m in length and 0.6 m in height.

Data Collection and Analysis

Associated Environmental Data

For every subsample, water depth and temperature were recorded. Additional habitat data were collected for a minimum of 25% of subsamples within each mesohabitat within each macrohabitat. For example, if two subsamples were conducted in the channel border of the channel crossover, habitat data were collected at one (i.e., 50%) of the subsamples. The subsamples for which habitat data were collected were randomly selected and determined *a priori*. For most gear types deployed in segment 11, habitat data were generally collected for one subsample in the channel crossover and two to four subsamples for the outside and inside bend. In addition to the collection of habitat data for randomly selected subsamples, these data were also collected for all subsamples that captured a pallid sturgeon. These habitat data collections were recorded as non-random and were not included toward meeting the 25% minimum of subsamples in that bend.

Habitat parameters collected included turbidity, substrate, and velocity. Turbidity was determined using a Hach 2100 P Turbidimeter and reported as nephelometric turbidity units (NTUs). Surface water velocity was estimated visually for every subsample by categorizing flow in meters per second (m/s) as: 0 = cannot determine, 1 = eddy or circular flow, 2 = 0.0-0.3 m/s, 3 = 0.3-0.6 m/s, 4 = 0.6-0.9 m/s, and 5 = >0.9 m/s. Water velocity was also recorded using a Marsh McBirney Flo-Mate Model 2000 and reported in m/s. Water velocity measurements were taken at the bottom, 80%, and 20% of the water column for gill nets, trammel nets, and otter trawls. This parameter was recorded at the bottom and 60% of the water column for mini-fyke nets.

All habitat parameters were collected at the midpoint of the sample, except depth which was collected at the start point, midpoint, and end point for gill nets, trammel nets, and otter trawls. For example, if an otter trawl was hauled 300 m, habitat data were collected 150 m downstream from the starting point (the approximate midpoint of the tow); for a 61 m (200 ft.) gill net set, habitat data were collected at the midpoint (at 30.5 m or 100 ft) of the net.

All habitat parameters for mini-fyke nets were measured at the point where the lead connected to the cab of the net.

Genetic Validation

All pallid sturgeon captured that did not appear to be previously marked were considered to be unknown origin fish pending genetic verification. Tissue samples collected at time of capture were subsequently sent to the USFWS Abernathy Fish Technology Center, Washington, to genetically determine the origin of the fish (i.e., hatchery-stocked or wild). Results for pallid sturgeon captured during the 2006 and 2007 sampling seasons were still pending at the time of this report.

Relative Condition

The condition of recaptured pallid sturgeon was determined using the relative condition factor (Anderson and Neumann 1996). Relative condition (K_n) was calculated as:

$$K_n = W/W',$$

where W was the observed weight and W' was the length-specific weight derived from the FL-weight equation from Keenlyne and Evanson (1993).

Relative Stock Densities

Relative stock densities were calculated for pallid and shovelnose sturgeon captured during the 2006 season. Relative stock density was calculated as:

$$\text{RSD} = \text{number of fish} \geq \text{specified length} / \text{number of fish} \geq \text{minimum stock length} \cdot 100$$

(Anderson and Neumann 1996). Minimum length specifications for pallid sturgeon were: stock = 330 mm; quality = 630 mm; preferred 840 mm; memorable 1,040 mm; trophy = 1,270 mm as reported by Shuman et al. (2006). For shovelnose sturgeon, minimum length specifications were: stock = 250 mm; quality = 380 mm; preferred = 510 mm; memorable = 640 mm; trophy = 810 mm as reported by Quist et al. (1998). In addition to these categories, two sub-stock length ranges for each species were defined by the PSPAP. Sub-stock categories were subdivided into 0 to 199 mm and 200 to 329 mm for pallid sturgeon and 0 to 149 mm and 150 to 249 mm for shovelnose sturgeon.

Analyses

All analyses were conducted on data collected from randomly selected bends with standard gear types set within standard habitats for each respective gear. Mean catch-per-unit-effort (CPUE) was calculated for each species within a bend sampled. Then a grand mean from all bends was derived to get an overall average CPUE for each fish species. CPUE for 1-inch trammel nets and otter trawls was reported as the number of fish/100 m drifted or trawled, respectively. Gill nets and mini-fyke nets reported CPUE as the number of fish per net night.

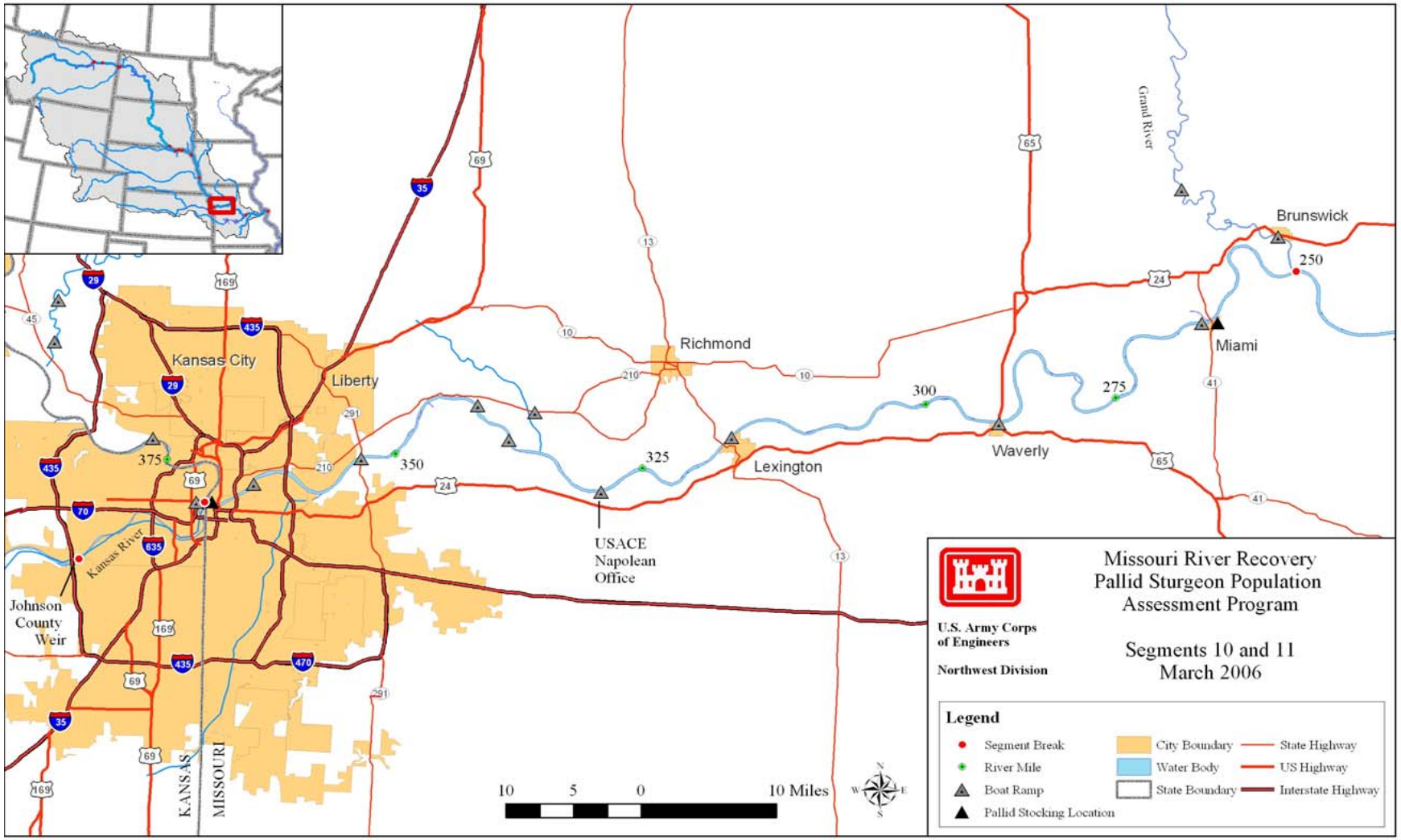

Figure 1a. Map of segment 11, the Kansas River with major tributaries, common landmarks, and historic stocking locations for pallid sturgeon. Segment 11 encompasses the Kansas River from the bend above the Johnson County Weir (River Mile 21.0) to the mouth (River Mile 0.0)

Results

Pallid Sturgeon

Objective 1. Document annual results and long-term trends in pallid sturgeon population abundance and geographic distribution throughout the Missouri River System.

Objective 2. Document annual results and long-term trends of habitat usage of wild pallid sturgeon and hatchery stocked pallid sturgeon by season and life stage.

Objective 3. Document population structure and dynamics of pallid sturgeon in the Missouri River System.

This was the first sampling season (2007) a pallid sturgeon was captured in segment 11, and the first documented pallid sturgeon from the Kansas River since 1952 (U.S. Fish and Wildlife Service 2000). It was captured during the month of April, within sturgeon sampling season. This was a hatchery-stocked pallid sturgeon captured at Kansas River mile 12.0 (Figure 1b). The fish was spawed at Gavins Point National Fish Hatchery in 2005, and released at Parkville, MO (Missouri River mile 377.5) in August 2006. The fish was at-large for seven months and traveled ten miles downstream to the mouth of the Kansas River, then traveled 12 miles up the Kansas River. The fork length at capture was 329 mm, and weight was 104.0 g (Table 6). At the time of stocking, the fork length was 283 mm and weighed 81 g. This pallid sturgeon grew an average of 0.202 mm and 0.101 grams per day after being stocked in the river. The relative condition factor (Kn) of the fish was 0.88, which is comparable to size-class condition results in segment 10 (Table 7).

Table 1. Number of bends sampled, mean effort per bend (mean number of deployments), and total effort by macrohabitat (total number of deployments) for segment 11 , the Kansas River, during fall through spring (sturgeon season) and summer (fish community season) in 2006 – 2007. N-E indicates the habitat is non-existent in the segment.

Gear	Number of Bends	Mean Effort	Macrohabitat													
			BRAD	CHXO	CONF	DEND	DRNG	ISB	OSB	SCCL	SCCS	SCCN	TRIB	TRML	TRMS	WILD
Fall through Spring - Sturgeon Season																
1 Inch Trammel Net	3	10.67	N-E	9	N-E	N-E	N-E	20	2	1	N-E	N-E	N-E	N-E	N-E	N-E
Gill Net	3	10.67	N-E	6	N-E	N-E	N-E	8	16	2	N-E	N-E	N-E	N-E	N-E	N-E
Otter Trawl	3	11.00	N-E	6	N-E	N-E	N-E	17	8	2	N-E	N-E	N-E	N-E	N-E	N-E
Summer – Fish Community Season																
1 Inch Trammel Net	3	12.33	N-E	4	N-E	N-E	N-E	23	8	2	N-E	N-E	N-E	N-E	N-E	N-E
Mini-Fyke Net	3	8.00	N-E	6	N-E	N-E	N-E	11	7	0	N-E	N-E	N-E	N-E	N-E	N-E
Otter Trawl	3	11.67	N-E	7	N-E	N-E	N-E	15	11	2	N-E	N-E	N-E	N-E	N-E	N-E

Table 2. Number of bends sampled, mean effort per bend (mean number of deployments), and total effort by mesohabitat (total number of deployments) for segment 11 , the Kansas River, during fall through spring (sturgeon season) and summer (fish community season) in 2006 – 2007. N-E indicates the habitat is non-existent in the segment.

Gear	Number of bends	Mean Effort	**Mesohabitat**					
			BAR	CHNB	DTWT	ITIP	POOL	TLWG
Fall through Spring – Sturgeon Season								
1 Inch Trammel Net	3	10.67	0	28	N-E	4	0	N-E
Gill Net	3	10.67	0	28	N-E	1	3	N-E
Otter Trawl	3	11.00	0	32	N-E	1	0	N-E
Summer – Fish Community Season								
1 Inch Trammel Net	3	12.33	0	35	N-E	2	0	N-E
Mini-Fyke Net	3	8.00	24	0	N-E	0	0	N-E
Otter Trawl	3	11.67	0	30	N-E	5	0	N-E

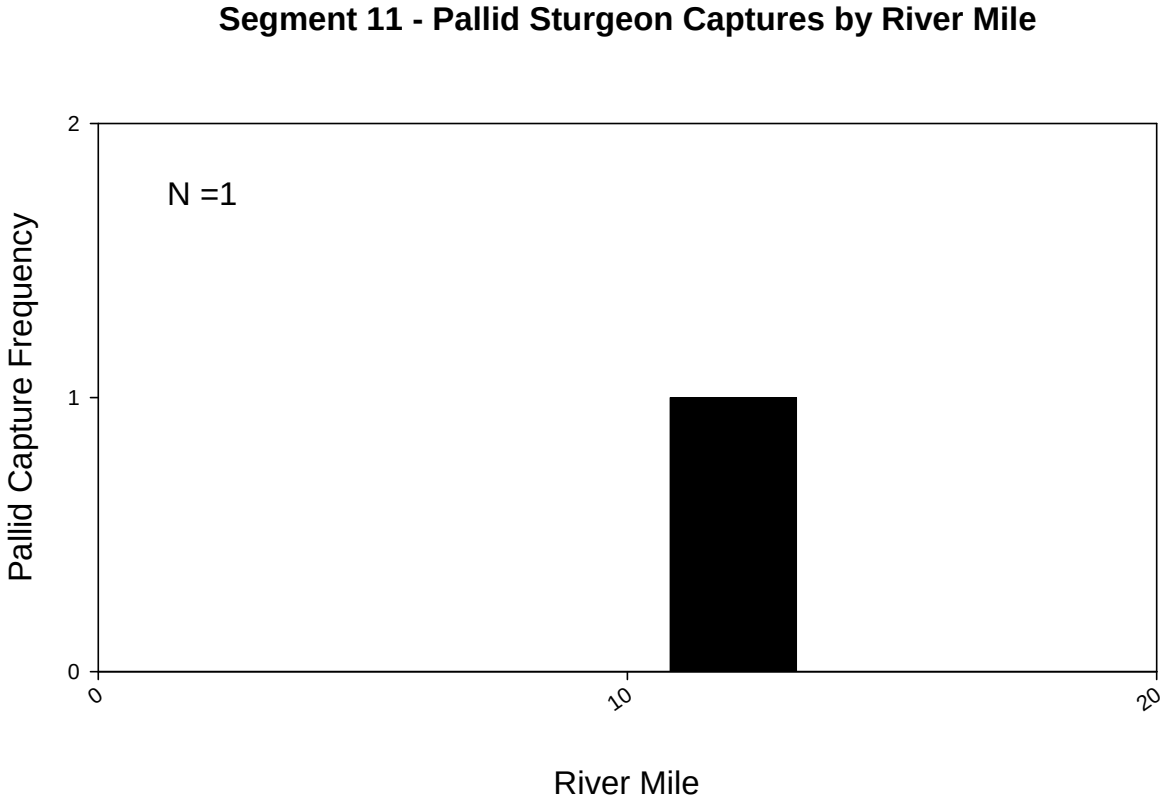

Figure 1b. Distribution of pallid sturgeon captures by river mile for segment 11, the Kansas River, during 2006-2007. Black bars represent pallid captures during Sturgeon Season and white bars during Fish Community Season. Figure includeds all pallid captures including non-random and wild samples.

Table 3. Pallid sturgeon (PDSG) capture summaries for all gears relative to habitat type and environmental variables on the Kansas River during 2006-2007. Means (minimum and maximum) are presented. Habitat definitions and codes presented in Appendix B. N-E indicates the habitat is non-existent in the segment.

Macro-	Meso-	Depth (m) (Effort)	Depth (m) (Catch)	Bottom Velocity (m/s) (Effort)	Bottom Velocity (m/s) (Catch)	Temp. °C (Effort)	Temp. °C (Catch)	Turbidity (ntu) (Effort)	Turbidity (ntu) (Catch)	Total Pallids caught
BRAD	BAR									.
	CHNB									.
	DTWT									.
	ITIP									.
	POOL									.
	TLWG									.
CHXO	BAR	0.7 (0.3-1.4)		0.17 (0.05-0.25)		26.0 (22.0-29.4)		160 (69-365)		.
	CHNB	2.5 (1.2-5.4)	2.2 (2.2-2.2)	0.55 (0.12-1.00)	0.41 (0.41-0.41)	18.4 (11.0-25.0)	11.0 (11.0-11.0)	291 (66-802)	308 (308-308)	1
	DTWT									.
	ITIP	4.5 (2.6-5.7)		0.37 (0.10-0.63)		21.5 (15.1-27.5)		480 (39-786)		.
	POOL	4.0 (4.0-4.0)		0.05 (0.05-0.05)		12.8 (12.8-12.8)		83 (83-83)		.
	TLWG									.
CONF	BAR									.
	CHNB									.
	DTWT									.
	ITIP									.
	POOL									.
	TLWG									.

Table 3 (continued).

Macro-	Meso-	Depth (m) (Effort)	Depth (m) (Catch)	Bottom Velocity (m/s) (Effort)	Bottom Velocity (m/s) (Catch)	Temp. °C (Effort)	Temp. °C (Catch)	Turbidity (ntu) (Effort)	Turbidity (ntu) (Catch)	Total Pallids caught
DEND	BAR									.
	CHNB									.
	DTWT									.
	ITIP									.
	POOL									.
DRNG	BAR									.
	CHNB									.
	DTWT									.
	ITIP									.
	POOL									.
	TLWG									.
ISB	BAR	0.8 (0.3-1.8)		0.10 (0.01-0.38)		26.8 (22.1-29.0)		81 (48-169)		.
	CHNB	3.3 (1.2-7.0)		0.44 (0.17-0.77)		19.7 (11.0-28.9)		293 (30-783)		.
	DTWT									.
	ITIP									.
	POOL									.
	TLWG									.
OSB	BAR	0.6 (0.3-1.2)		0.09 (0.01-0.19)		24.7 (22.1-29.4)		196 (63-387)		.
	CHNB	2.9 (1.2-5.7)		0.32 (0.09-0.88)		19.3 (11.0-28.9)		150 (35-430)		.
	DTWT									.

Macro-	Meso-	Depth (m) (Effort)	Depth (m) (Catch)	Bottom Velocity (m/s) (Effort)	Bottom Velocity (m/s) (Catch)	Temp. °C (Effort)	Temp. °C (Catch)	Turbidity (ntu) (Effort)	Turbidity (ntu) (Catch)	Total Pallids caught
	ITIP									.
	POOL	3.1 (2.9-3.3)		0.06 (0.04-0.08)		11.9 (11.0-12.8)		78 (54-102)		.
	TLWG									.
SCCL	BAR									.
	CHNB	3.9 (3.3-4.4)		0.70 (0.70-0.70)		16.1 (11.0-21.1)		307 (307-307)		.
	DTWT									.
	ITIP	4.5 (3.0-6.0)		0.31 (0.00-0.78)		16.9 (11.0-22.0)		193 (139-297)		.
	POOL									.
	TLWG									.
SCCS	BAR									
	CHNB									
	DTWT									
	ITIP									
	POOL									
	TLWG									

Table 3 (continued).

Macro-	Meso-	Depth (m) (Effort)	Depth (m) (Catch)	Bottom Velocity (m/s) (Effort)	Bottom Velocity (m/s) (Catch)	Temp. °C (Effort)	Temp. °C (Catch)	Turbidity (ntu) (Effort)	Turbidity (ntu) (Catch)	Total Pallids caught
SCCN	BAR									.
	POOL									.
	CHNB									.
	TLWG									.
	ITIP									.
TRIB	BAR									.
	CHNB									.
	DTWT									.
	ITIP									.
	POOL									.
	TLWG									.
TRMS	BAR									.
	CHNB									.
	DTWT									.
	ITIP									.
	POOL									.
	TLWG									.
WILD	BAR									
	CHNB									
	DTWT									
	ITIP									
	POOL									.
	TLWG									.

Table 6. Mean fork length, weight, relative condition factor (Kn), growth rates, and water temperature for hatchery-reared pallid sturgeon captures by year class at the time of stocking and recapture during 2007 from segment 11 , the Kansas River. Relative condition factor was calculated using the equation in Keenlyne and Evanson (1993). Standard error (+/- 2SE) was calculated where N>1 and is represented on second line of each year.

Year class	N	Stock Data			Recapture Data			Growth Data	
		Length (mm)	Weight (g)	Kn	Length (mm)	Weight (g)	Kn	Length (mm/d)	Weight (g/d)
2001									
2002									
2003									
2004									
2005	1	283	81.0	1.137	329	104.0	0.881	0.202	0.101
		.	.	.	.	.	.	.	.
2006									

Table 7. Incremental relative stock density (RSD)[a] and relative condition factor (Kn) for all pallid sturgeon captured with all gear by a length category during 2006-2007 in the Kansas River. Length categories[b] determined using the methods proposed by Shuman et al. (2006). Relative condition factor was calculated using the equation in Keenlyne and Evanson (1993).

Length Category	N	RSD	Kn (+/- 2SE)
Sturgeon Season			
Sub-stock (0-199)	0	.	0
Sub-stock (200-329)	1	.	0.881
Stock	0	.	0
Quality	0	.	0
Preferred	0	.	0
Memorable	0	.	0
Trophy	0	.	0
Overall Kn	.	.	0.881
Fish Community Season			
Sub-stock (0-199)	0	.	0
Sub-stock (200-329)	0	.	0
Stock	0	.	0
Quality	0	.	0
Preferred	0	.	0
Memorable	0	.	0
Trophy	0	.	0
Overall Kn			

[a] RSD = (# of fish of a specified length class / # of fish ≥ minimum stock length fish) * 100.
[b] Length categories based on the percentage of the largest known pallid sturgeon: Sub-stock FL < 330 mm (20 %), Stock FL =330 - 629 mm (20 – 36 %), Quality FL = 630 – 839 mm (36 – 45 %), Preferred FL = 840 – 1039 mm (45 – 59 %), Memorable FL = 1040 – 1269 mm (59 – 74 %), Trophy FL ≥ 1270 mm (>74 %).

Year comparisons, Gear evaluation and Habitat associations

Standard gill nets were set in the Kansas River during the 2007 sampling season for a total of 60 net nights. One pallid sturgeon was captured in the Kansas River in one of these gill net sets, resulting in a catch-per-unit-effort of 0.016 fish/ net night. This net was set adjacent to an island within the channel cross-over. The net was set off an extension of the island located on the main-channel side of the river and deployed in a small slack-water area with a minimum amount of eddy flow.

Upon retrieval of the gill net, the pallid sturgeon was extremely entangled in the 1.5 inch multifilament gill. The fish was carefully and quickly removed from the net and efforts were made to revive the fish by placing it in a tub of fresh river water. Unfortunately, we did not succeed in our efforts, and the pallid sturgeon expired. Since this was a hatchery fish (therefore known-age), it was transferred to Southern Illinois University to aid research efforts of pallid sturgeon age-assessment techniques. All documentation and protocols for this mortality were followed under direction of the pallid sturgeon recovery leader and according to USFWS pallid sturgeon handling protocols.

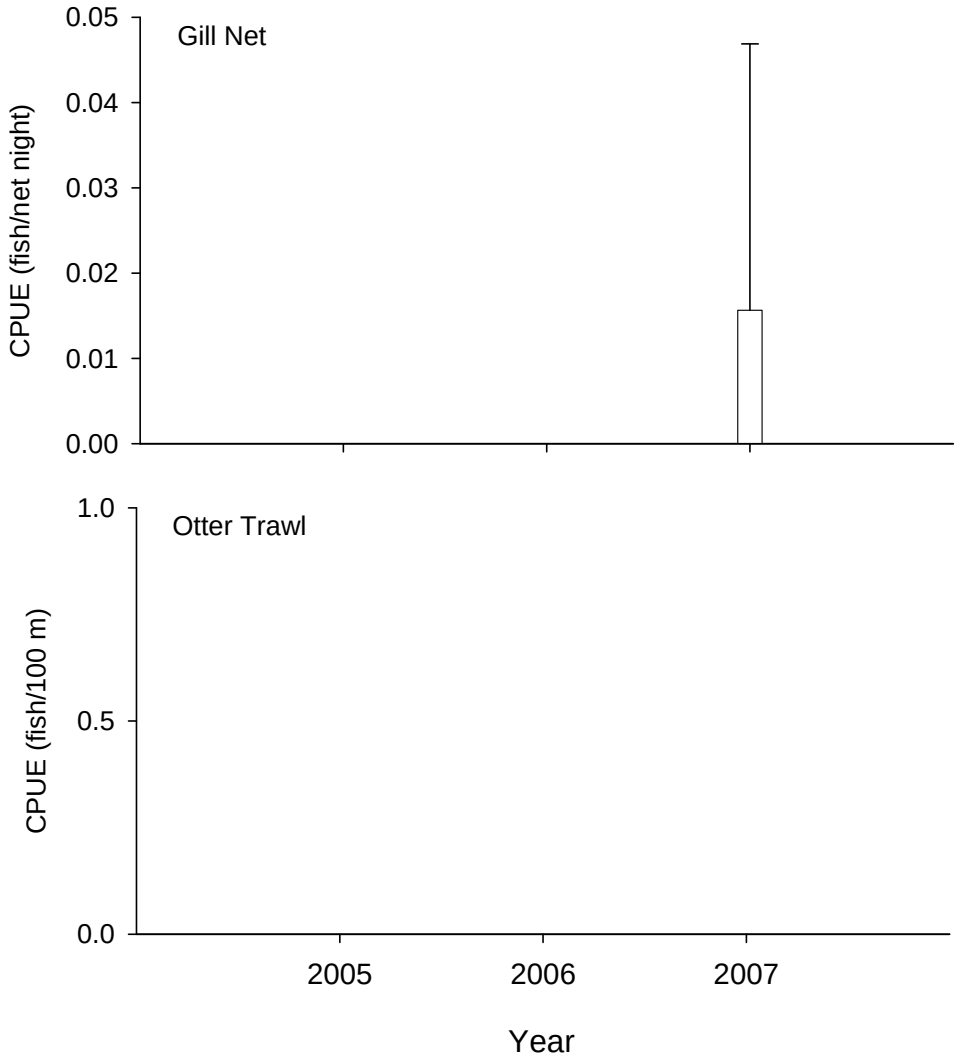

Figure 2. Mean annual catch-per-unit-effort (+/- 2 SE) of wild (black bars), hatchery reared (white bars), and unknown origin (cross-hatched bars) pallid sturgeon using gill nets and otter trawls in segment 11, the Kansas River, during sturgeon season 2006-2007. Unknown origin pallid sturgeon are awaiting genetic verification.

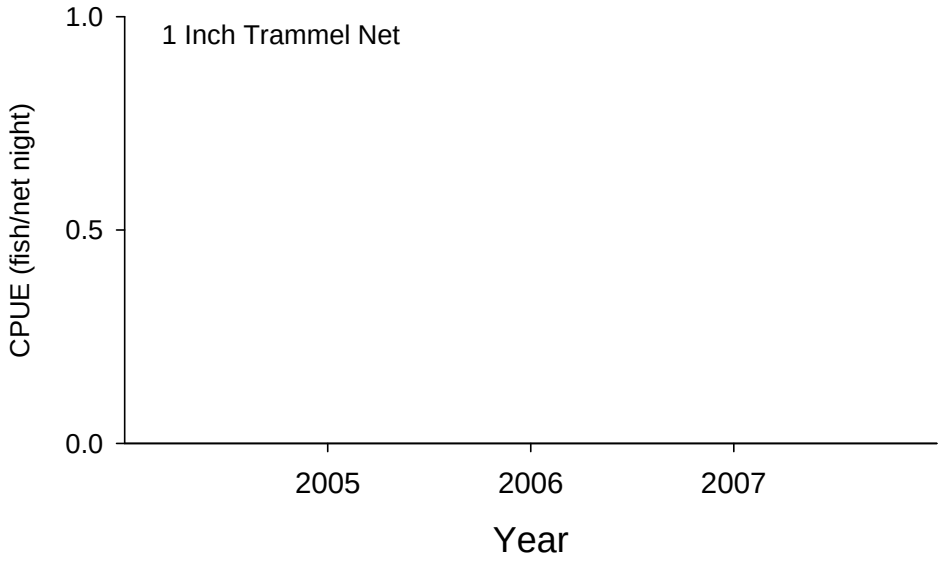

Figure 3. Mean annual catch-per-unit-effort (+/- 2 SE) of wild (black bars), hatchery reared (white bars), and unknown origin (cross-hatched bars) pallid sturgeon using 1 trammel nets in segment 11. the Kansas River, during sturgeon season 2006-2007. Unknown origin pallid sturgeon are awaiting genetic verification.

Segment 11 - Pallid Sturgeon / Fish Community Season

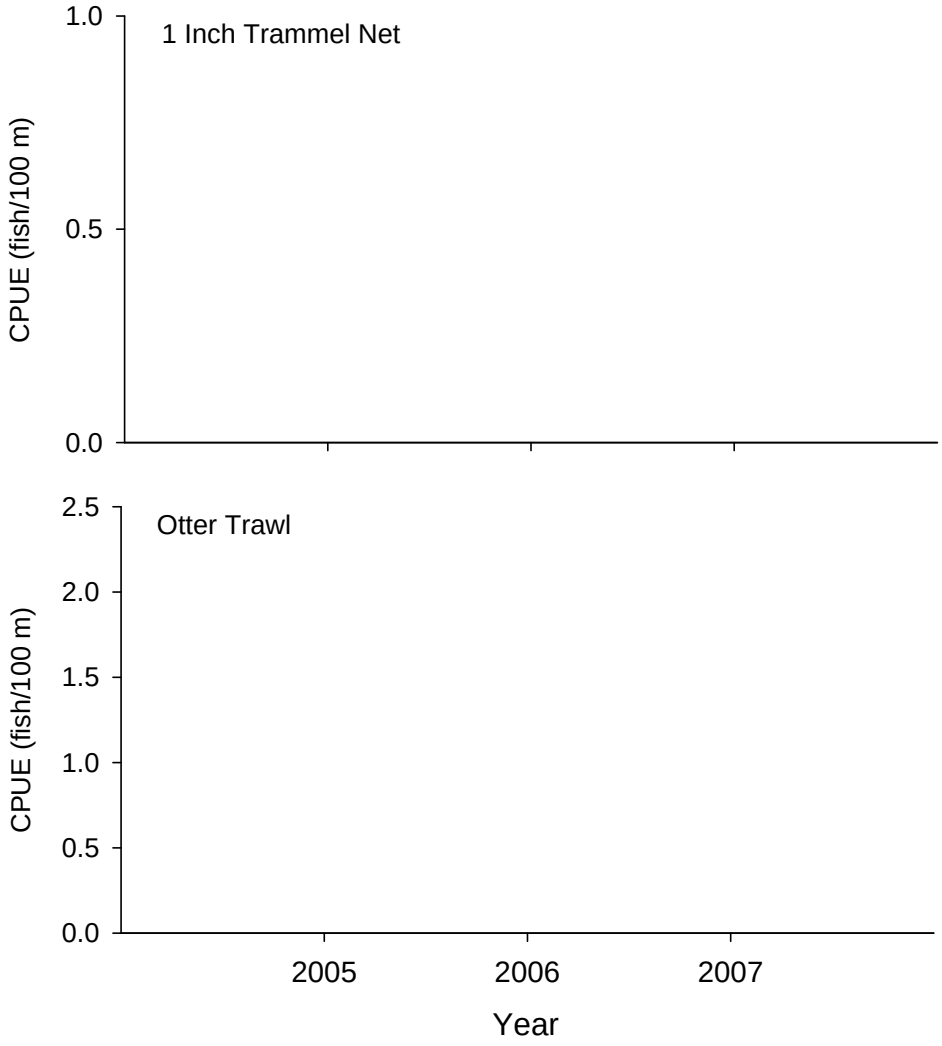

Figure 5. Mean annual catch-per-unit-effort (+/- 2 SE) of wild (black bars), hatchery reared (white bars), and unknown origin (cross-hatched bars) pallid sturgeon using 1 inch trammel nets and otter trawls in segment 11, the Kansas River, during fish community season 2006-2007. Unknown origin pallid sturgeon are awaiting genetic verification.

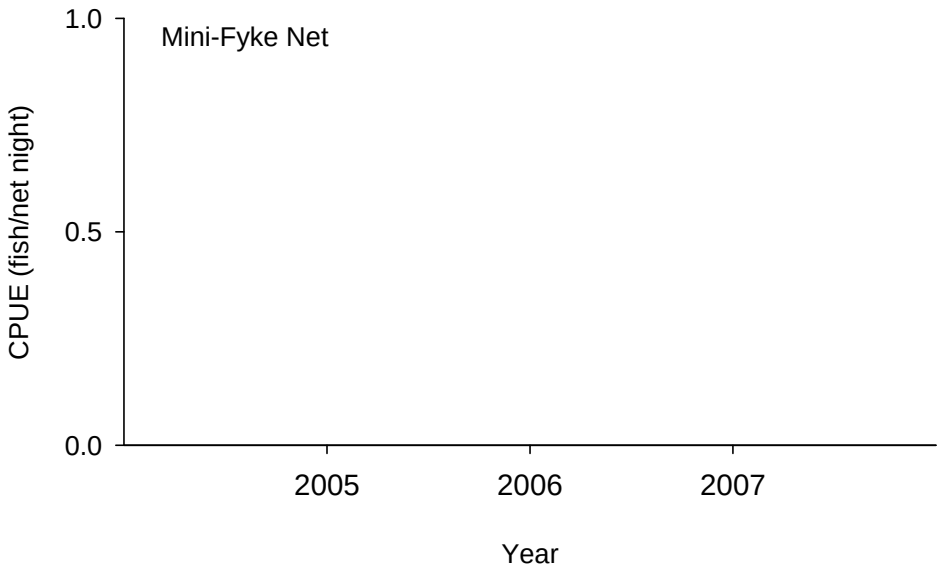

Figure 7. Mean annual catch-per-unit-effort (+/- 2 SE) of wild (black bars), hatchery reared (white bars), and unknown origin (cross-hatched bars) pallid sturgeon using mini-fyke nets in segment 11, the Kansas River, during fish community season 2006-2007. Unknown origin pallid sturgeon are awaiting genetic verification.

Table 9. Total number of sub-stock size (0-199 mm) pallid sturgeon captured for each gear during each season and the proportion caught within each macrohabitat type in segment 11, the Kansas River, during 2006 – 2007. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. Size categories described in Table 7. N-E indicates the habitat is non-existent in the segment.

Gear	N	Macrohabitat													
		BRAD	CHXO	CONF	DEND	DRNG	ISB	OSB	SCCL	SCCS	SCCN	TRIB	TRML	TRMS	WILD
Sturgeon Season (Fall through Spring)															
1 Inch Trammel Net	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	.	0	28	0	0	0	58	12	2	0	0	0	0	0	0
Gill Net	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	.	0	17	0	0	0	27	50	7	0	0	0	0	0	0
Otter Trawl	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	.	0	16	0	0	0	55	24	5	0	0	0	0	0	0
Fish Community Season (Summer)															
1 Inch Trammel Net	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	.	0	8	0	0	0	63	22	7	0	0	0	0	0	0
Mini-Fyke Net	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	.	0	25	0	0	0	46	29	0	0	0	0	0	0	0
Otter Trawl	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	.	0	19	0	0	0	47	28	6	0	0	0	0	0	0

Table 10. Total number of sub-stock size (0-199 mm) pallid sturgeon captured for each gear during each season and the proportion caught within each mesohabitat type in segment 11, the Kansas River, during 2006 – 2007. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. Size categories described in Table 7. N-E indicates the habitat is non-existent in the segment.

Gear	N	**Mesohabitat**					
		BAR	CHNB	DTWT	ITIP	POOL	TLWG
Sturgeon Season (Fall through Spring)							
1 Inch Trammel Net	0	0	0	0	0	0	0
	.	0	90	0	10	0	0
Gill Net	0	0	0	0	0	0	0
	.	0	88	0	3	8	0
Otter Trawl	0	0	0	0	0	0	0
	.	0	97	0	3	0	0
Fish Community Season (Summer)							
1 Inch Trammel Net	0	0	0	0	0	0	0
	.	0	93	0	7	0	0
Mini-Fyke Net	0	0	0	0	0	0	0
	.	100	0	0	0	0	0
Otter Trawl	0	0	0	0	0	0	0
	.	0	87	0	13	0	0

Table 11. Total number of sub-stock size (200-329 mm) pallid sturgeon captured for each gear during each season and the proportion caught within each macrohabitat type in segment 11, the Kansas River, during 2006 – 2007. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. Size categories described in Table 7. N-E indicates the habitat is non-existent in the segment.

Gear	N	Macrohabitat													
		BRAD	CHXO	CONF	DEND	DRNG	ISB	OSB	SCCL	SCCS	SCCN	TRIB	TRML	TRMS	WILD
Sturgeon Season (Fall through Spring)															
1 Inch Trammel Net	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	.	0	28	0	0	0	58	12	2	0	0	0	0	0	0
Gill Net	1	0	100	0	0	0	0	0	0	0	0	0	0	0	0
	.	0	17	0	0	0	27	50	7	0	0	0	0	0	0
Otter Trawl	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	.	0	16	0	0	0	55	24	5	0	0	0	0	0	0
Fish Community Season (Summer)															
1 Inch Trammel Net	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	.	0	8	0	0	0	63	22	7	0	0	0	0	0	0
Mini-Fyke Net	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	.	0	25	0	0	0	46	29	0	0	0	0	0	0	0
Otter Trawl	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	.	0	19	0	0	0	47	28	6	0	0	0	0	0	0

Table 12. Total number of sub-stock size (200-329 mm) pallid sturgeon captured for each gear during each season and the proportion caught within each mesohabitat type in segment 11, the Kansas River, during 2006 – 2007. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. Size categories described in Table 7. N-E indicates the habitat is non-existent in the segment.

Gear	N	**Mesohabitat**					
		BAR	CHNB	DTWT	ITIP	POOL	TLWG
Sturgeon Season (Fall through Spring)							
1 Inch Trammel Net	0	0	0	0	0	0	0
	.	0	90	0	10	0	0
Gill Net	1	0	100	0	0	0	0
	.	0	88	0	3	8	0
Otter Trawl	0	0	0	0	0	0	0
	.	0	97	0	3	0	0
Fish Community Season (Summer)							
1 Inch Trammel Net	0	0	0	0	0	0	0
	.	0	93	0	7	0	0
Mini-Fyke Net	0	0	0	0	0	0	0
	.	100	0	0	0	0	0
Otter Trawl	0	0	0	0	0	0	0
	.	0	87	0	13	0	0

Table 13. Total number of stock size (330-629 mm) pallid sturgeon captured for each gear during each season and the proportion caught within each macrohabitat type in segment 11, the Kansas River, during 2006 – 2007. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. Size categories described in Table 7. N-E indicates the habitat is non-existent in the segment.

Gear	N	Macrohabitat													
		BRAD	CHXO	CONF	DEND	DRNG	ISB	OSB	SCCL	SCCS	SCCN	TRIB	TRML	TRMS	WILD
Sturgeon Season (Fall through Spring)															
1 Inch Trammel Net	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	.	0	28	0	0	0	58	12	2	0	0	0	0	0	.
Gill Net	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	.	0	17	0	0	0	27	50	7	0	0	0	0	0	.
Otter Trawl	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	.	0	16	0	0	0	55	24	5	0	0	0	0	0	.
Fish Community Season (Summer)															
1 Inch Trammel Net	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	.	0	8	0	0	0	63	22	7	0	0	0	0	0	.
Mini-Fyke Net	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	.	0	25	0	0	0	46	29	0	0	0	0	0	0	.
Otter Trawl	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	.	0	19	0	0	0	47	28	6	0	0	0	0	0	.

Table 14. Total number of stock size (330-629 mm) pallid sturgeon captured for each gear during each season and the proportion caught within each mesohabitat type in segment 11, the Kansas River, during 2006 – 2007. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. Size categories described in Table 7. N-E indicates the habitat is non-existent in the segment.

Gear	N	**Mesohabitat**					
		BAR	CHNB	DTWT	ITIP	POOL	TLWG
Sturgeon Season (Fall through Spring)							
1 Inch Trammel Net	0	0	0	0	0	0	0
	.	0	90	0	10	0	0
Gill Net	0	0	0	0	0	0	0
	.	0	88	0	3	8	0
Otter Trawl	0	0	0	0	0	0	0
	.	0	97	0	3	0	0
Fish Community Season (Summer)							
1 Inch Trammel Net	0	0	0	0	0	0	0
	.	0	93	0	7	0	0
Mini-Fyke Net	0	0	0	0	0	0	0
	.	100	0	0	0	0	0
Otter Trawl	0	0	0	0	0	0	0
	.	0	87	0	13	0	0

Table 15. Total number of quality size and greater (≥630 mm) pallid sturgeon captured for each gear during each season and the proportion caught within each macrohabitat type in segment 11, the Kansas River, during 2006 – 2007. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. Size categories described in Table 7. N-E indicates the habitat is non-existent in the segment.

Gear	N	Macrohabitat													
		BRAD	CHXO	CONF	DEND	DRNG	ISB	OSB	SCCL	SCCS	SCCN	TRIB	TRML	TRMS	WILD
Sturgeon Season (Fall through Spring)															
1 Inch Trammel Net	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	.	0	28	0	0	0	58	12	2	0	0	0	0	0	0
Gill Net	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	.	0	17	0	0	0	27	50	7	0	0	0	0	0	0
Otter Trawl	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	.	0	16	0	0	0	55	24	5	0	0	0	0	0	0
Fish Community Season (Summer)															
1 Inch Trammel Net	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	.	0	8	0	0	0	63	22	7	0	0	0	0	0	0
Mini-Fyke Net	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	.	0	25	0	0	0	46	29	0	0	0	0	0	0	0
Otter Trawl	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	.	0	19	0	0	0	47	28	6	0	0	0	0	0	0

Table 16. Total number of quality size and greater (≥630 mm) pallid sturgeon captured for each gear during each season and the proportion caught within each mesohabitat type in segment 11, the Kansas River, during 2006 – 2007. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. Size categories described in Table 7. N-E indicates the habitat is non-existent in the segment.

Gear	N	Mesohabitat					
		BAR	CHNB	DTWT	ITIP	POOL	TLWG
Sturgeon Season (Fall through Spring)							
1 Inch Trammel Net	0	0	0	0	0	0	0
	.	0	90	0	10	0	0
Gill Net	0	0	0	0	0	0	0
	.	0	88	0	3	8	0
Otter Trawl	0	0	0	0	0	0	0
	.	0	97	0	3	0	0
Fish Community Season (Summer)							
1 Inch Trammel Net	0	0	0	0	0	0	0
	.	0	93	0	7	0	0
Mini-Fyke Net	0	0	0	0	0	0	0
	.	100	0	0	0	0	0
Otter Trawl	0	0	0	0	0	0	0
	.	0	87	0	13	0	0

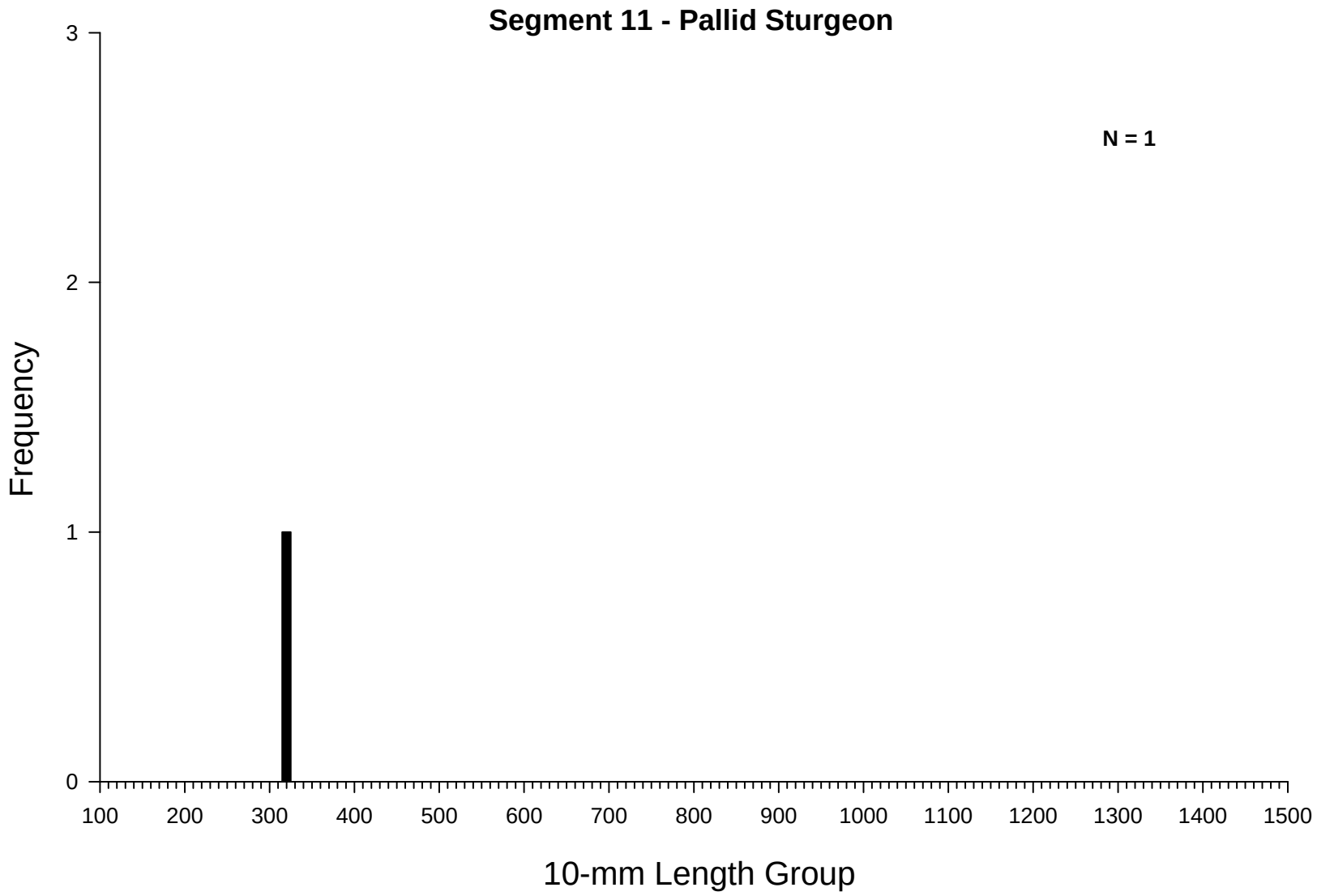

Figure 8. Length frequency of pallid sturgeon captured during fall through spring (sturgeon season, black bars) and summer (fish community season, white bars) in segment 11, the Kansas River, during 2006 - 2007 including non-random and wild samples.

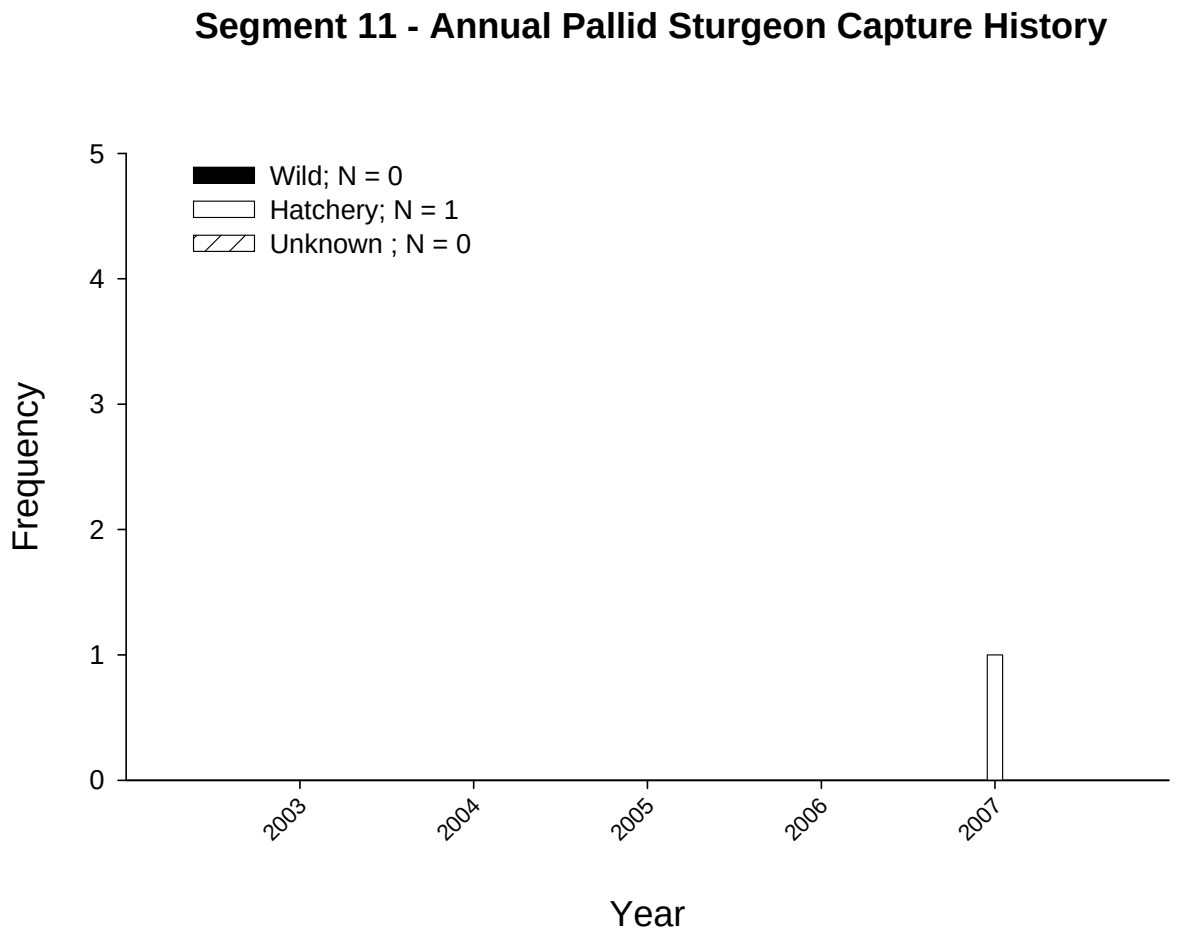

Figure 9. Annual capture history of wild (black bars), hatchery reared (white bars), and unknown origin (cross-hatched bars) pallid sturgeon collected in segment 11, the Kansas River, from 2006 to 2007. Figure is designed to compareoverall pallid sturgeon captures from year to year and may be biased by variable effort between years.

Shovelnose X Pallid Sturgeon Hybrids

Two shovelnose X pallid sturgeon hybrids were captured in segment 11 during the 2007 sampling season, equal to the amount captured in the 2006 season. Both these fish were captured with gill nets on 11 April 2007. One was captured in the channel cross over in the same gill net the pallid sturgeon was captured (river mile 12). The other hybrid was captured in the outside bend, at approximately Kansas River mile 9.5. Fork lengths were 625 and 640 mm. Both fish displayed three strong characteristics of a hybrid sturgeon: a somewhat elongated snout, smaller inner barbles and patchy scales on the ventral side. MCI (0.3956) and CI (0.0758) scores were calculated for one of the hybrid sturgeon.

Targeted Native River Species

Objective 4. Document annual results and long-term trends in native target species population abundance and geographic distribution throughout the Missouri River System.

Objective 5. Document annual results and long-term trends of habitat usage of the target native species by season.

Shovelnose Sturgeon

Year and gear comparisons

A total of 532 shovelnose sturgeon was captured in all three bends sampled in segment 11 during the 2007 season (Figure 17). This is more than double the number of individuals captured in 2006 (N = 253). Fork lengths ranged from 201 – 764 mm, a wider range of fish than were captured in 2006 (275 – 726 mm).

Gill nets captured the most shovelnose sturgeon (N = 379) in a total of 60 net-nights (Tables 1 and 2). This has been the most effective gear at capturing shovelnose sturgeon in 2006 and 2007 (CPUE = 7.7 and 6.53 fish/ net night, respectively; Figure 11). In Segment 11, fish ranged in size from 356 – 764, with the majority (94%, N = 377) of the fish falling in quality and above (>380 mm) size classes.

Trammel nets were drifted a total of 7,893 m during the sampling seasons in 2007, with an average of 2,631 m per bend. They captured a total of 120 shovelnose sturgeon during sturgeon (N = 66) and fish community (N = 54) seasons. In both 2006 (275 – 726 m) and 2007 (201 – 700 m), trammel nets captured the widest size-range of fish compared to gill nets and otter trawls. Trammel nets are the second-most effective gear at capturing shovelnose sturgeon, with an overall average of 1.69 fish/ m (Appendix F). However, trammel nets in both seasons during 2006 sampling seasons captured, on average, over five fish per meter drifted. This is much more than the average CPUE of trammel nets in 2007 (Figures 12 and 14).

Total distance trawled in segment 11 during 2007 was 9,258 m during sturgeon (5,389 m) and fish community (3,869 m) seasons. This resulted in the total catch of 33 shovelnose sturgeon, ranging in size from 306 – 685 m. Combining both seasons, otter trawls captured an average of 0.384 fish/ m, an increase from the 2006 average (0.046 fish/ m).

The number of shovelnose sturgeon over 510 mm in 2007 increased to 96%, up from 94% in 2006 (Table 25). Relative weight (Wr) of shovelnose sturgeon in segment 11 is inversely related to size, except where a very low sample size exists.

Segment 11 - Shovelnose Sturgeon / Sturgeon Season

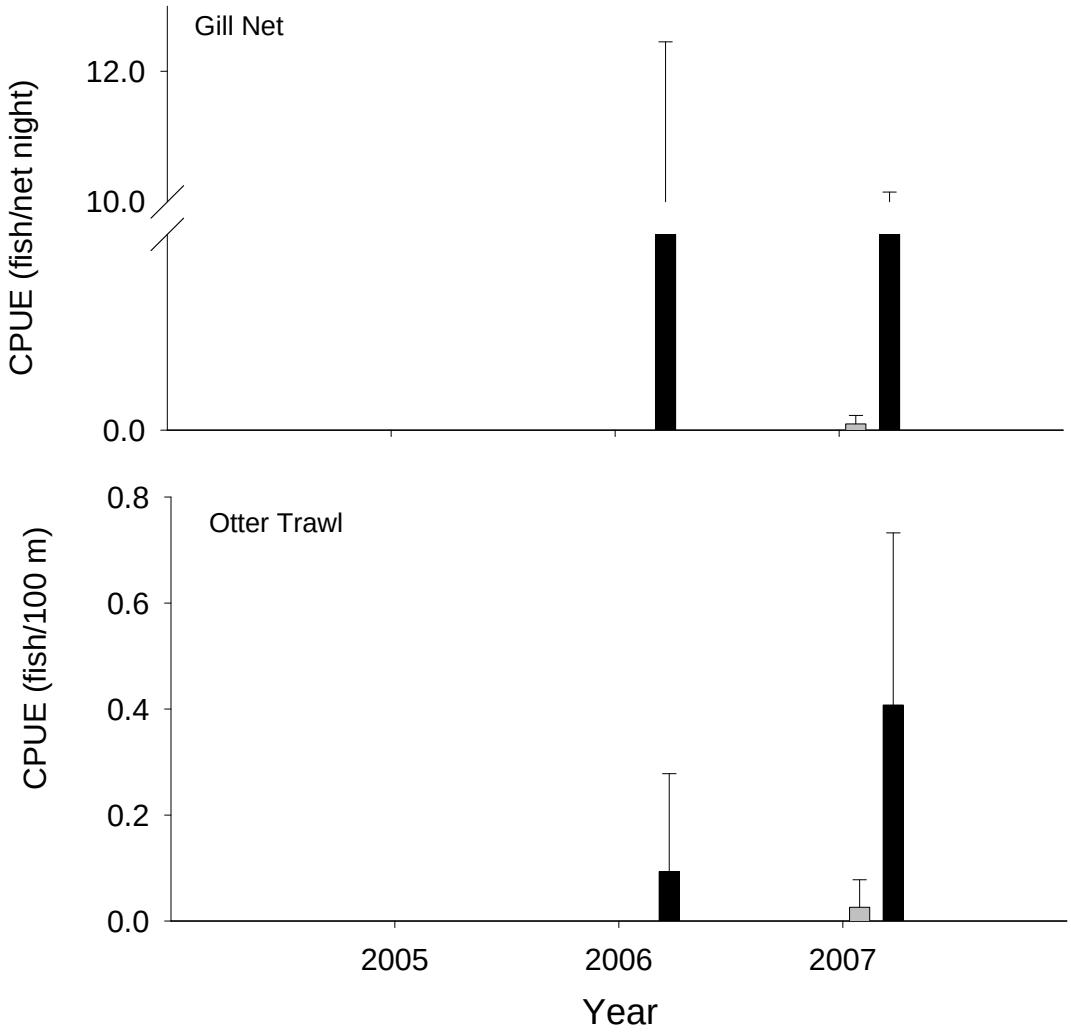

Figure 11. Mean annual catch-per-unit-effort (+/- 2SE) of sub-stock size (0-149 mm; white bars), sub-stock size (150-249; cross-hatched), stock size (250-379 mm; gray bars), and quality and above size (> 380 mm; black bars) shovelnose sturgeon using gill nets and otter trawls in segment 11, the Kansas River, during sturgeon season 2006 - 2007.

Segment 11 - Shovelnose Sturgeon / Sturgeon Season

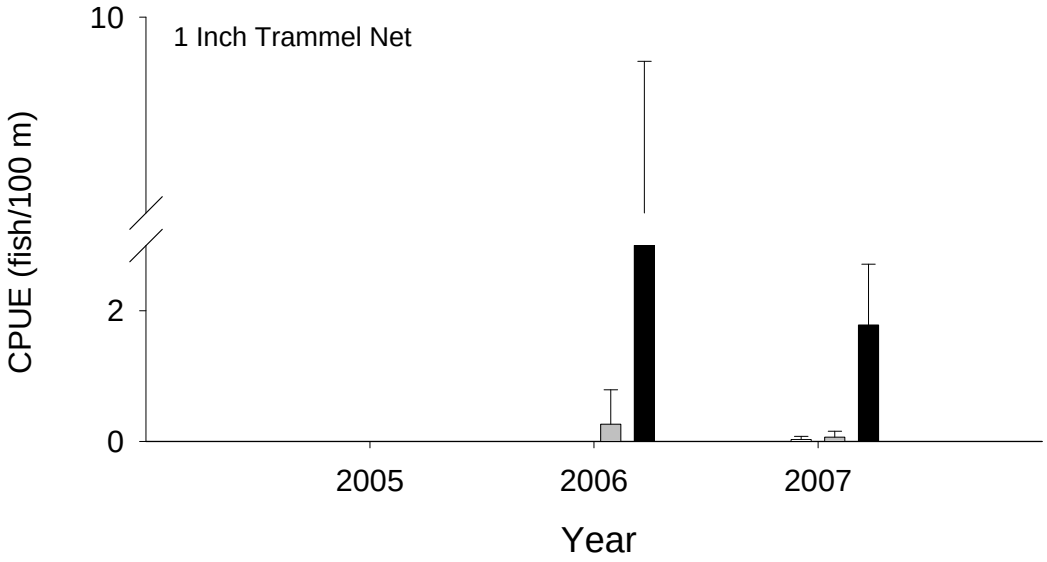

Figure 12. Mean annual catch-per-unit-effort (+/- 2SE) of sub-stock size (0-149 mm; white bars), sub-stock size (150-249; cross-hatched), stock size (250-379 mm; gray bars), and quality and above size (> 380 mm; black bars) shovelnose sturgeon using 1 inch trammel nets in segment 11, the Kansas River, during sturgeon season 2006 - 2007.

Segment 11 - Shovelnose Sturgeon / Fish Community Season

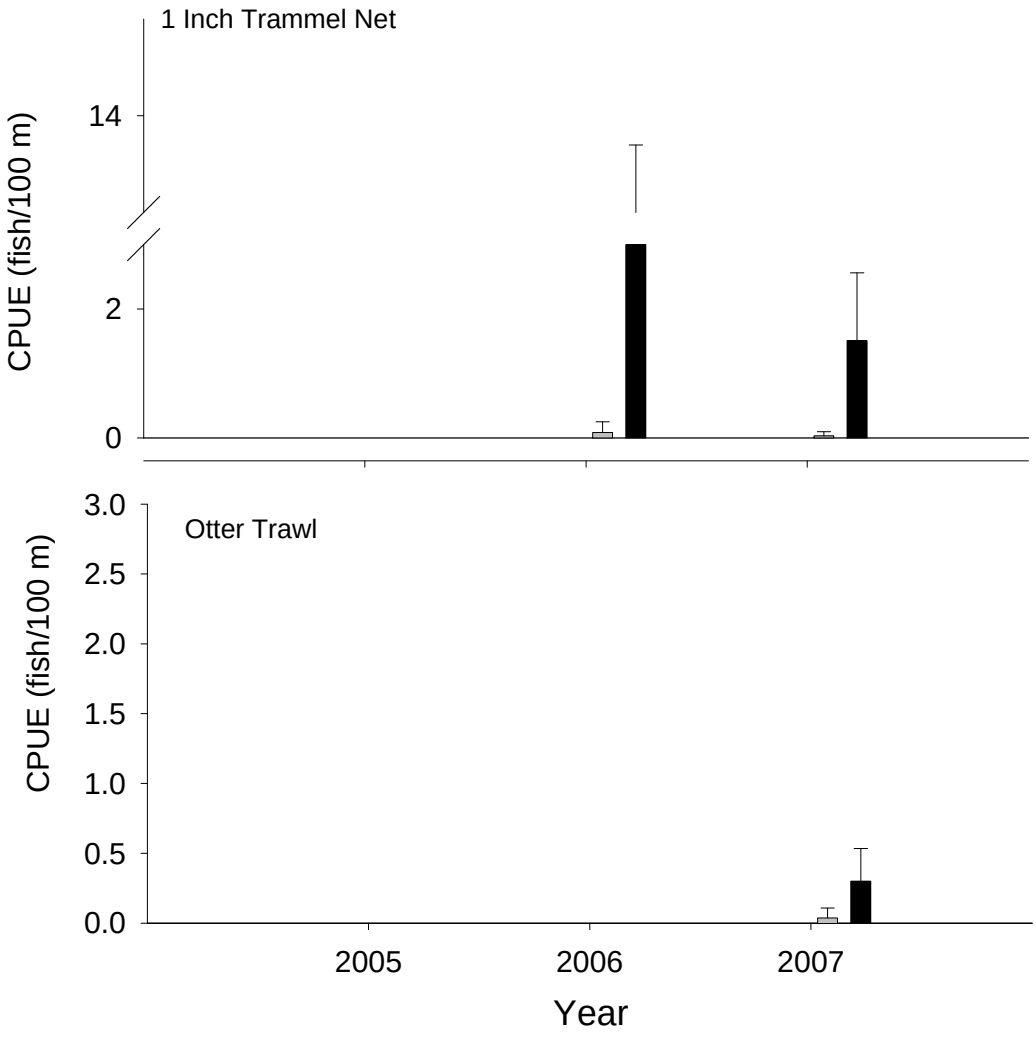

Figure 14. Mean annual catch-per-unit-effort (+/- 2SE) of sub-stock size (0-149 mm; white bars), sub-stock size (150-249; cross-hatched), stock size (250-379 mm; gray bars), and quality and above size (> 380 mm; black bars) shovelnose sturgeon using 1 inch trammel nets and otter trawls in segment 11, the Kansas River, during fish community season 2006 - 2007.

Segment 11 - Shovelnose Sturgeon / Fish Community Season

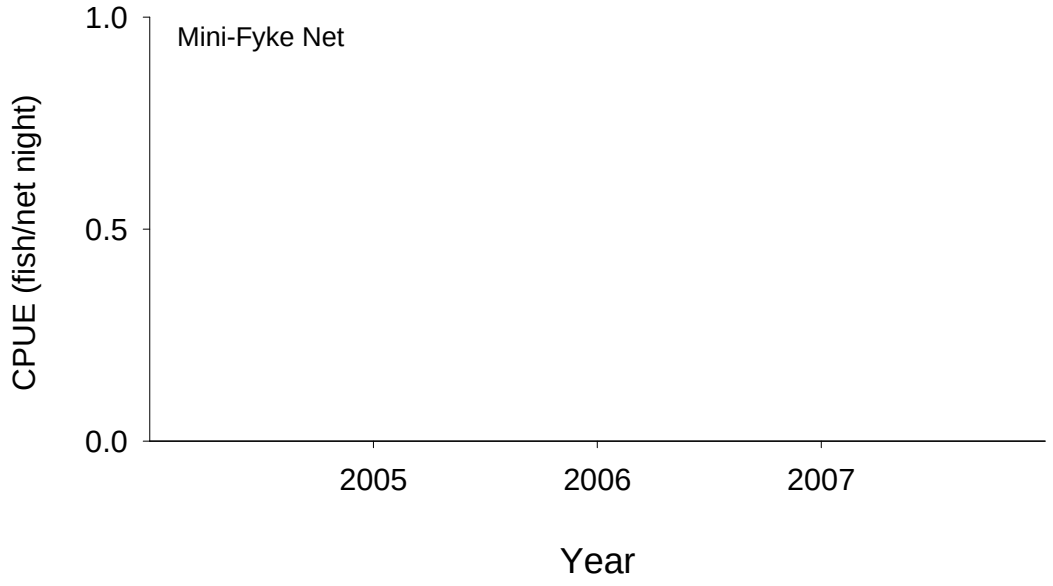

Figure 15. Mean annual catch-per-unit-effort (+/- 2SE) of sub-stock size (0-149 mm; white bars), sub-stock size (150-249; cross-hatched), stock size (250-379 mm; gray bars), and quality and above size (> 380 mm; black bars) shovelnose sturgeon using mini-fyke nets and bag seines in segment 11, the Kansas River during fish community season 2006 - 2007.

Habitat Use

In 2007 (as in 2006), most shovelnose sturgeon were captured in proportion to the amount of effort expended in each habitat type. Most shovelnose sturgeon were captured in outside bend macrohabitats (42%; Tables 17-24), but was slightly down from 2006 (50%). Inside bend and channel-crossover macrohabitats types accounted for 23% and 22% percent of shovelnose sturgeon captures. In 2006, 50% of shovelnose sturgeon were captured in the channel-crossovers. Most shovelnose (83%) were captured in channel border mesohabitats in 2007. The remainder of shovelnose sturgeon were captured from pool (9%) and island tip (8%) mesohabitats. Seventy-seven percent of shovelnose sturgeon were captured along bankline microhabitats. Shovelnose sturgeon were also caught in association with open water bar areas and a few small dike structures (14 and 9%, respectively).

Table 17. Total number of sub-stock size (0-149 mm) shovelnose sturgeon captured for each gear during each season and the proportion caught within each macrohabitat type in segment 11, the Kansas River, during 2006 – 2007. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. Size categories described in Table 25. N-E indicates the habitat is non-existent in the segment.

Gear	N	Macrohabitat													
		BRAD	CHXO	CONF	DEND	DRNG	ISB	OSB	SCCL	SCCS	SCCN	TRIB	TRML	TRMS	WILD
Sturgeon Season (Fall through Spring)															
1 Inch Trammel Net	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	.	0	28	0	0	0	58	12	2	0	0	0	0	0	0
Gill Net	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	.	0	17	0	0	0	27	50	7	0	0	0	0	0	0
Otter Trawl	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	.	0	16	0	0	0	55	24	5	0	0	0	0	0	0
Fish Community Season (Summer)															
1 Inch Trammel Net	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	.	0	8	0	0	0	63	22	7	0	0	0	0	0	0
Mini-Fyke Net	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	.	0	25	0	0	0	46	29	0	0	0	0	0	0	0
Otter Trawl	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	.	0	19	0	0	0	47	28	6	0	0	0	0	0	0

Table 18. Total number of sub-stock size (0-149 mm) shovelnose sturgeon captured for each gear during each season and the proportion caught within each mesohabitat type in segment 11, the Kansas River, during 2006 – 2007. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. Size categories described in Table 25. N-E indicates the habitat is non-existent in the segment.

Gear	N	Mesohabitat					
		BAR	CHNB	DTWT	ITIP	POOL	TLWG
Sturgeon Season (Fall through Spring)							
1 Inch Trammel Net	0	0	0	0	0	0	0
	.	0	90	0	10	0	0
Gill Net	0	0	0	0	0	0	0
	.	0	88	0	3	8	0
Otter Trawl	0	0	0	0	0	0	0
	.	0	97	0	3	0	0
Fish Community Season (Summer)							
1 Inch Trammel Net	0	0	0	0	0	0	0
	.	0	93	0	7	0	0
Mini-Fyke Net	0	0	0	0	0	0	0
	.	100	0	0	0	0	0
Otter Trawl	0	0	0	0	0	0	0
	.	0	87	0	13	0	0

Table 19. Total number of sub-stock size (150-249 mm) shovelnose sturgeon captured for each gear during each season and the proportion caught within each macrohabitat type in segment 11, the Kansas River, during 2006 – 2007. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. Size categories described in Table 25. N-E indicates the habitat is non-existent in the segment.

Gear	N	Macrohabitat													
		BRAD	CHXO	CONF	DEND	DRNG	ISB	OSB	SCCL	SCCS	SCCN	TRIB	TRML	TRMS	WILD
Sturgeon Season (Fall through Spring)															
1 Inch Trammel Net	1	0	0	0	0	0	100	0	0	0	0	0	0	0	0
	.	0	28	0	0	0	58	12	2	0	0	0	0	0	0
Gill Net	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	.	0	17	0	0	0	27	50	7	0	0	0	0	0	0
Otter Trawl	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	.	0	16	0	0	0	55	24	5	0	0	0	0	0	0
Fish Community Season (Summer)															
1 Inch Trammel Net	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	.	0	8	0	0	0	63	22	7	0	0	0	0	0	0
Mini-Fyke Net	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	.	0	25	0	0	0	46	29	0	0	0	0	0	0	0
Otter Trawl	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	.	0	19	0	0	0	47	28	6	0	0	0	0	0	0

Table 20. Total number of sub-stock size (150-249 mm) shovelnose sturgeon captured for each gear during each season and the proportion caught within each mesohabitat type in segment 11, the Kansas River, during 2006 – 2007. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. Size categories described in Table 25. N-E indicates the habitat is non-existent in the segment.

Gear	N	Mesohabitat					
		BAR	CHNB	DTWT	ITIP	POOL	TLWG
Sturgeon Season (Fall through Spring)							
1 Inch Trammel Net	1	0	100	0	0	0	0
	.	0	90	0	10	0	0
Gill Net	0	0	0	0	0	0	0
	.	0	88	0	3	8	0
Otter Trawl	0	0	0	0	0	0	0
	.	0	97	0	3	0	0
Fish Community Season (Summer)							
1 Inch Trammel Net	0	0	0	0	0	0	0
	.	0	93	0	7	0	0
Mini-Fyke Net	0	0	0	0	0	0	0
	.	100	0	0	0	0	0
Otter Trawl	0	0	0	0	0	0	0
	.	0	87	0	13	0	0

Table 21. Total number of stock size (250-379 mm) shovelnose sturgeon captured for each gear during each season and the proportion caught within each macrohabitat type in segment 11, the Kansas River, during 2006 – 2007. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. Size categories described in Table 25. N-E indicates the habitat is non-existent in the segment.

Gear	N	Macrohabitat													
		BRAD	CHXO	CONF	DEND	DRNG	ISB	OSB	SCCL	SCCS	SCCN	TRIB	TRML	TRMS	WILD
Sturgeon Season (Fall through Spring)															
1 Inch Trammel Net	2	0	0	0	0	0	100	0	0	0	0	0	0	0	0
	.	0	28	0	0	0	58	12	2	0	0	0	0	0	0
Gill Net	2	0	0	0	0	0	0	50	50	0	0	0	0	0	0
	.	0	17	0	0	0	27	50	7	0	0	0	0	0	0
Otter Trawl	1	0	0	0	0	0	100	0	0	0	0	0	0	0	0
	.	0	16	0	0	0	55	24	5	0	0	0	0	0	0
Fish Community Season (Summer)															
1 Inch Trammel Net	1	0	0	0	0	0	100	0	0	0	0	0	0	0	0
	.	0	8	0	0	0	63	22	7	0	0	0	0	0	0
Mini-Fyke Net	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	.	0	25	0	0	0	46	29	0	0	0	0	0	0	0
Otter Trawl	2	0	100	0	0	0	0	0	0	0	0	0	0	0	0
	.	0	19	0	0	0	47	28	6	0	0	0	0	0	0

Table 22. Total number of stock size (250-379 mm) shovelnose sturgeon captured for each gear during each season and the proportion caught within each mesohabitat type in segment 11, the Kansas River, during 2006 – 2007. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. Size categories described in Table 25. N-E indicates the habitat is non-existent in the segment.

Gear	N	Mesohabitat					
		BAR	CHNB	DTWT	ITIP	POOL	TLWG
Sturgeon Season (Fall through Spring)							
1 Inch Trammel Net	2	0	100	0	0	0	0
	.	0	90	0	10	0	0
Gill Net	2	0	100	0	0	0	0
	.	0	88	0	3	8	0
Otter Trawl	1	0	100	0	0	0	0
	.	0	97	0	3	0	0
Fish Community Season (Summer)							
1 Inch Trammel Net	1	0	100	0	0	0	0
	.	0	93	0	7	0	0
Mini-Fyke Net	0	0	0	0	0	0	0
	.	100	0	0	0	0	0
Otter Trawl	2	0	0	0	100	0	0
	.	0	87	0	13	0	0

Table 23. Total number of quality size and greater (≥380 mm) shovelnose sturgeon captured for each gear during each season and the proportion caught within each macrohabitat type in segment 11, the Kansas River, during 2006 – 2007. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. Size categories described in Table 25. N-E indicates the habitat is non-existent in the segment.

Gear	N	Macrohabitat													
		BRAD	CHXO	CONF	DEND	DRNG	ISB	OSB	SCCL	SCCS	SCCN	TRIB	TRML	TRMS	WILD
Sturgeon Season (Fall through Spring)															
1 Inch Trammel Net	61	0	11	0	0	0	87	0	2	0	0	0	0	0	0
	.	0	28	0	0	0	58	12	2	0	0	0	0	0	0
Gill Net	377	0	26	0	0	0	4	52	18	0	0	0	0	0	0
	.	0	17	0	0	0	27	50	7	0	0	0	0	0	0
Otter Trawl	18	0	39	0	0	0	50	11	0	0	0	0	0	0	0
	.	0	16	0	0	0	55	24	5	0	0	0	0	0	0
Fish Community Season (Summer)															
1 Inch Trammel Net	53	0	2	0	0	0	58	40	0	0	0	0	0	0	0
	.	0	8	0	0	0	63	22	7	0	0	0	0	0	0
Mini-Fyke Net	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	.	0	25	0	0	0	46	29	0	0	0	0	0	0	0
Otter Trawl	12	0	8	0	0	0	50	42	0	0	0	0	0	0	0
	.	0	19	0	0	0	47	28	6	0	0	0	0	0	0

Table 24. Total number of quality size and greater (≥380 mm) shovelnose sturgeon captured for each gear during each season and the proportion caught within each mesohabitat type in segment 11, the Kansas River, during 2006 – 2007. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. Size categories described in Table 25. N-E indicates the habitat is non-existent in the segment.

Gear	N	Mesohabitat					
		BAR	CHNB	DTWT	ITIP	POOL	TLWG
Sturgeon Season (Fall through Spring)							
1 Inch Trammel Net	63	0	93	0	7	0	0
	.	0	90	0	10	0	0
Gill Net	377	0	78	0	9	13	0
	.	0	88	0	3	8	0
Otter Trawl	18	0	100	0	0	0	0
	.	0	97	0	3	0	0
Fish Community Season (Summer)							
1 Inch Trammel Net	53	0	100	0	0	0	0
	.	0	93	0	7	0	0
Mini-Fyke Net	0	0	0	0	0	0	0
	.	100	0	0	0	0	0
Otter Trawl	12	0	100	0	0	0	0
	.	0	87	0	13	0	0

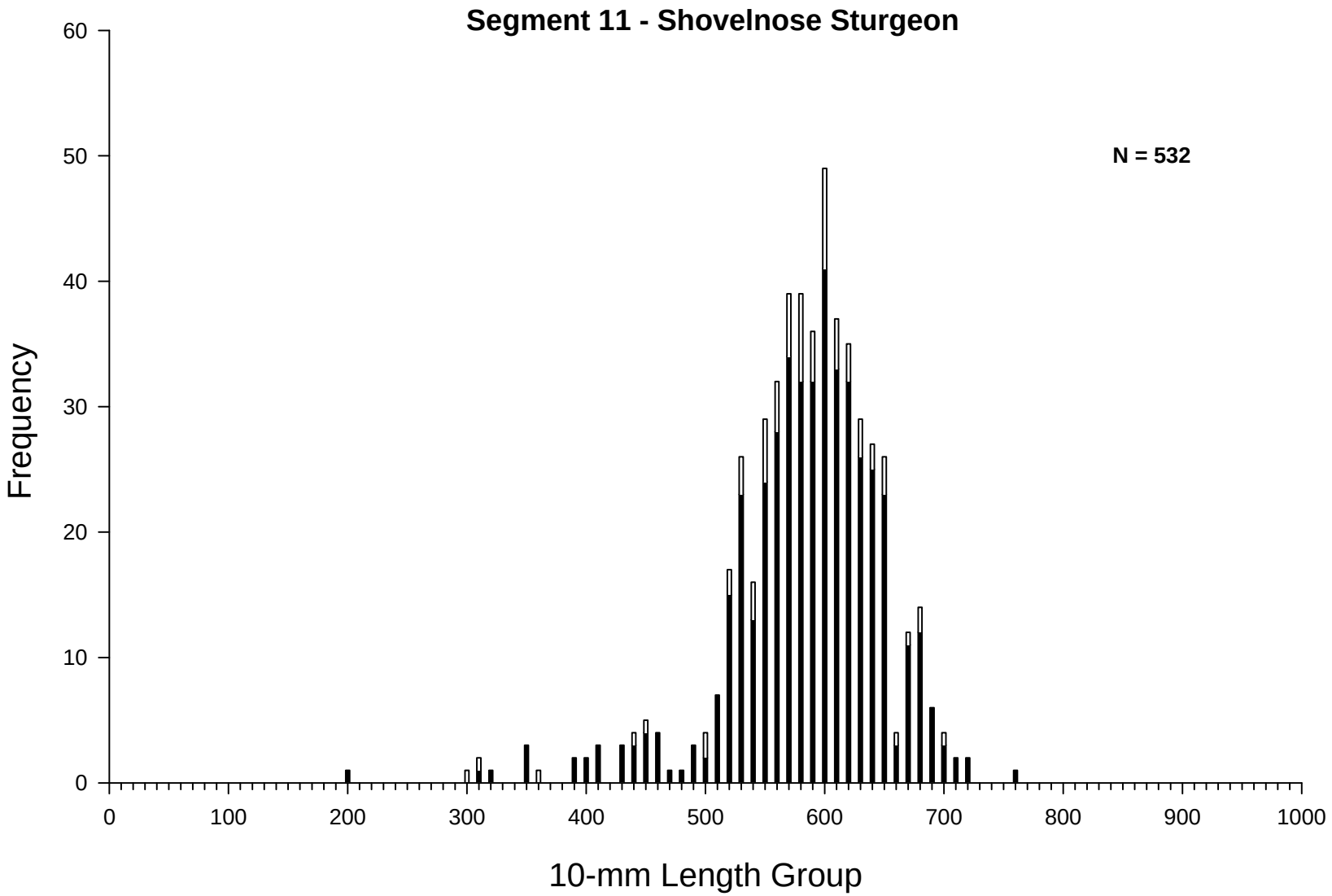

Figure 17. Length frequency of shovelnose sturgeon from fall through spring (sturgeon season, black bars) and summer (fish community season, white bars) in segment 11, the Kansas River, during 2006 - 2007.

Table 25. Incremental relative stock density (RSD)[a] and mean relative weight (Wr) by a length category for shovelnose sturgeon in segment 11, the Kansas River, captured during 2006 – 2007. Length categories[b] determined using methods proposed by Quist (1998).

Length category	N	RSD	Wr (+/- 2SE)
Sturgeon Season			
Sub-stock (0-149 mm)	0	.	.
Sub-stock (150-249 mm)	1	.	45.58
Stock	5	.	91.97 (4.398)
Quality	28	6	91.98 (3.589)
Preferred	341	74	88.36 (1.182)
Memorable	89	19	79.99 (2.820)
Trophy	0	0	.
Overall Wr	.	.	86.93 (1.109)
Fish Community Season			
Sub-stock (0-149 mm)	0	.	.
Sub-stock (150-249 mm)	0	.	.
Stock	3		83.78 (5.642)
Quality	4	6	87.49 (5.213)
Preferred	51	75	86.55 (5.777)
Memorable	10	15	83.02 (5.298)
Trophy	0	.	.
Overall Wr	.	.	85.97 (4.411)

[a] RSD = (# of fish of a specified length class / # of fish ≥ minimum stock length fish) * 100.
[b] Length categories based on the percentage of the largest known shovelnose sturgeon: Sub-stock FL < 250 mm (20 %), Stock FL =250-379 mm (20 – 36 %), Quality FL = 380 – 509 mm (36 – 45 %), Preferred FL = 510 - 639 mm (45 – 59 %), Memorable FL = 640 – 809 mm (59 – 74 %), Trophy FL ≥ 810 mm (>74 %).

Sturgeon Chub

There were no sturgeon chub captured in Segment 11 during the sample years 2005 - 2007, therefore Figures 18 – 21 and Tables 26 – 27 have been omitted.

Sicklefin Chub

There were no sicklefin chub captured in segment 11 during the 2007 sampling season. There has only been one captured in this segment since 2006. This individual (26 mm total length) was captured in an otter trawl during fish community season (Figure 22).

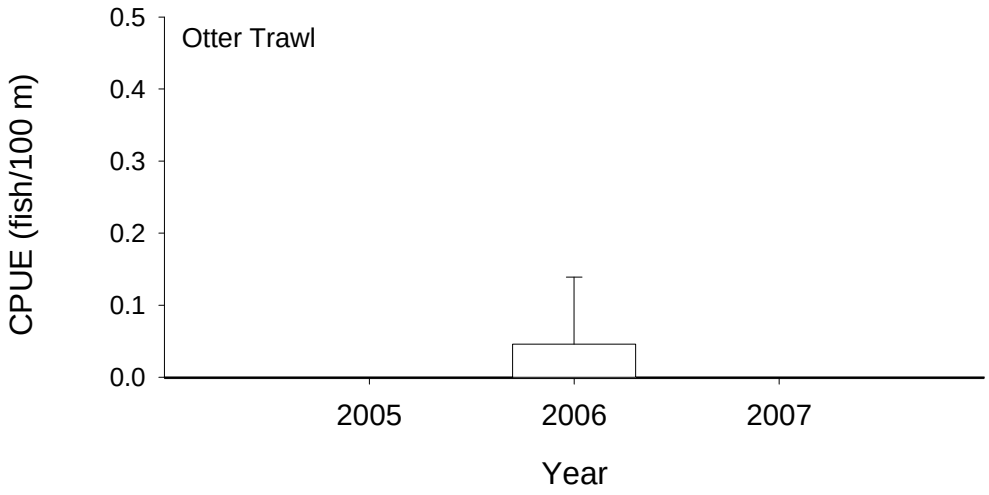

Figure 22. Mean annual catch-per-unit-effort (+/- 2SE) of sicklefin chub using otter trawls in segment 11, the Kansas River, during sturgeon season 2006-2007.

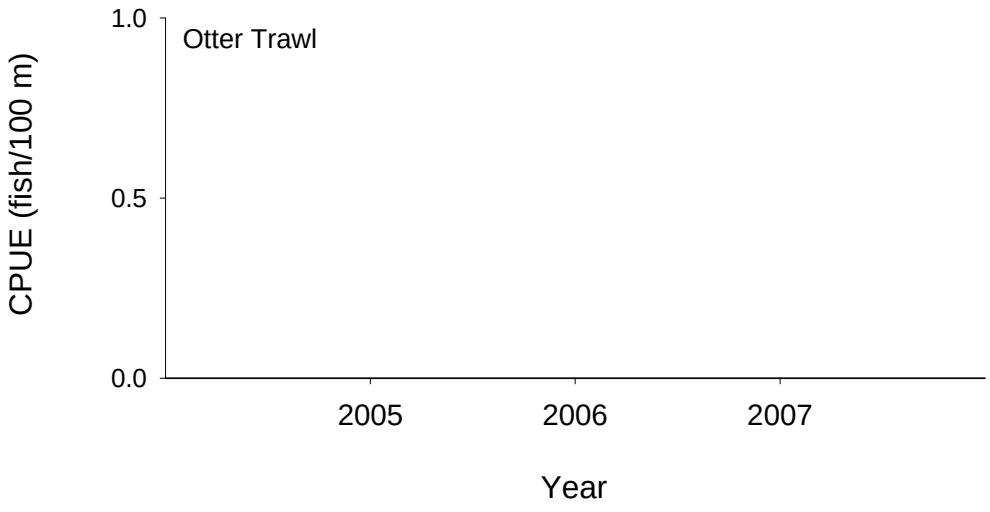

Figure 23. Mean annual catch-per-unit-effort (+/- 2SE) of sicklefin chub using otter trawls in segment 11, the Kansas River, during fish community season 2006-2007.

Segment 11 - Sicklefin Chub / Fish Community Season

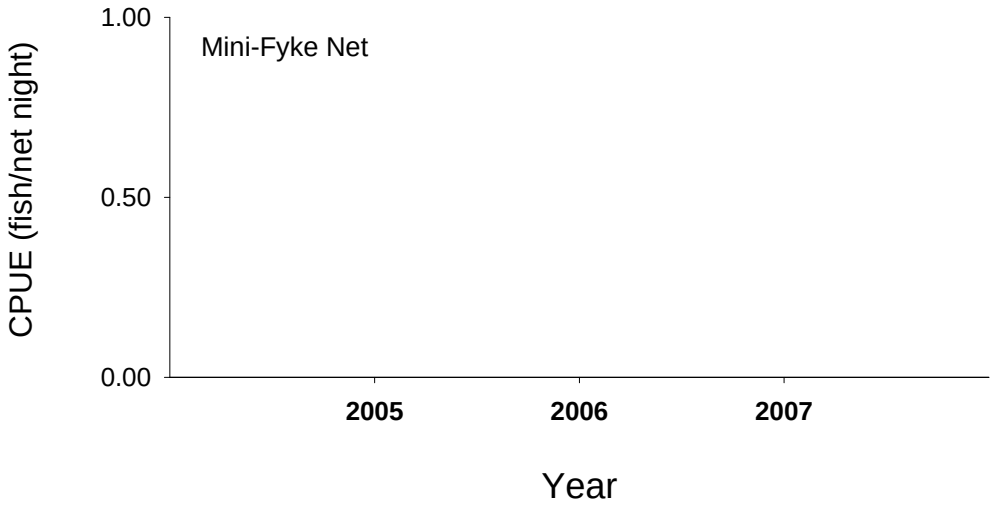

Figure 24. Mean annual catch-per-unit-effort (+/- 2SE) of sicklefin chub using mini-fyke nets in segment 11, the Kansas River, during fish community season 2006-2007.

Table 28. Total number of sicklefin chubs captured for each gear during each season and the proportion caught within each macrohabitat type in segment 11, the Kansas River, during 2006 – 2007. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. N-E indicates the habitat is non-existent in the segment.

Gear	N	Macrohabitat													
		BRAD	CHXO	CONF	DEND	DRNG	ISB	OSB	SCCL	SCCS	SCCN	TRIB	TRML	TRMS	WILD
Sturgeon Season (Fall through Spring)															
1 Inch Trammel Net	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	.	0	28	0	0	0	58	12	2	0	0	0	0	0	0
Gill Net	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	.	0	17	0	0	0	27	50	7	0	0	0	0	0	0
Otter Trawl	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	.	0	16	0	0	0	55	24	5	0	0	0	0	0	0
Fish Community Season (Summer)															
1 Inch Trammel Net	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	.	0	8	0	0	0	63	22	7	0	0	0	0	0	0
Mini-Fyke Net	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	.	0	25	0	0	0	46	29	0	0	0	0	0	0	0
Otter Trawl	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	.	0	19	0	0	0	47	28	6	0	0	0	0	0	0

Table 29. Total number of sicklefin chubs captured for each gear during each season and the proportion caught within each mesohabitat type in segment 11, the Kansas River, during 2006 – 2007. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. N-E indicates the habitat is non-existent in the segment.

Gear	N	Mesohabitat					
		BAR	CHNB	DTWT	ITIP	POOL	TLWG
Sturgeon Season (Fall through Spring)							
1 Inch Trammel Net	0	0	0	0	0	0	0
	.	0	90	0	10	0	0
Gill Net	0	0	0	0	0	0	0
	.	0	88	0	3	8	0
Otter Trawl	0	0	0	0	0	0	0
	.	0	97	0	3	0	0
Fish Community Season (Summer)							
1 Inch Trammel Net	0	0	0	0	0	0	0
	.	0	93	0	7	0	0
Mini-Fyke Net	0	0	0	0	0	0	0
	.	100	0	0	0	0	0
Otter Trawl	0	0	0	0	0	0	0
	.	0	87	0	13	0	0

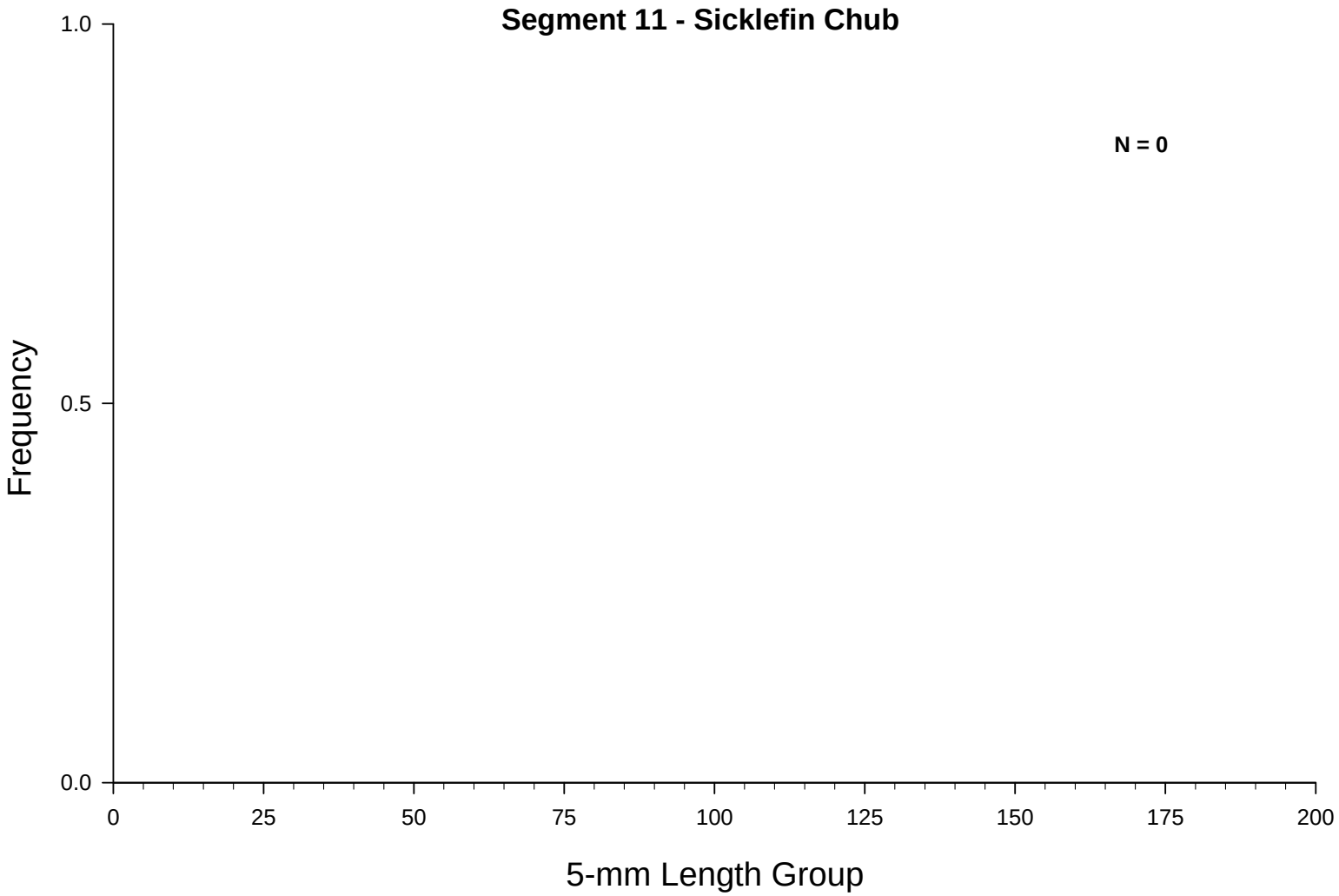

Figure 25. Length frequency of sicklefin chubs during fall through spring (sturgeon season, black bars) and summer (fish community season, white bars) in segment 11, the Kansas River, during 2006 - 2007.

Speckled Chub

Sample year 2007 was the first year a speckled chub was captured in segment 11 by the Pallid Sturgeon Population Assessment Project. Fish were captured in both sturgeon (N = 3) and fish community seasons (N = 4). All were captured below the Johnson County Weir, in two of the three bends sampled. Otter trawl was the only gear to catch this species. During sturgeon season, the catch-per-unit effort was lower (0.053 fish/ m) than during fish community season (0.097 fish/ m; Figures 26 and 27). Size of fish ranged from 49 – 51 and 28 – 48 mm during sturgeon and fish community seasons, respectively (Figure 29). Only 1 speckled chub was captured in the channel crossover habitat, while the rest were captured either in the inside or outside bend of the river (Table 30). Most (N = 5) were captured in channel border habitats, while a few (N = 2) were captured in an island tip area (Table 31).

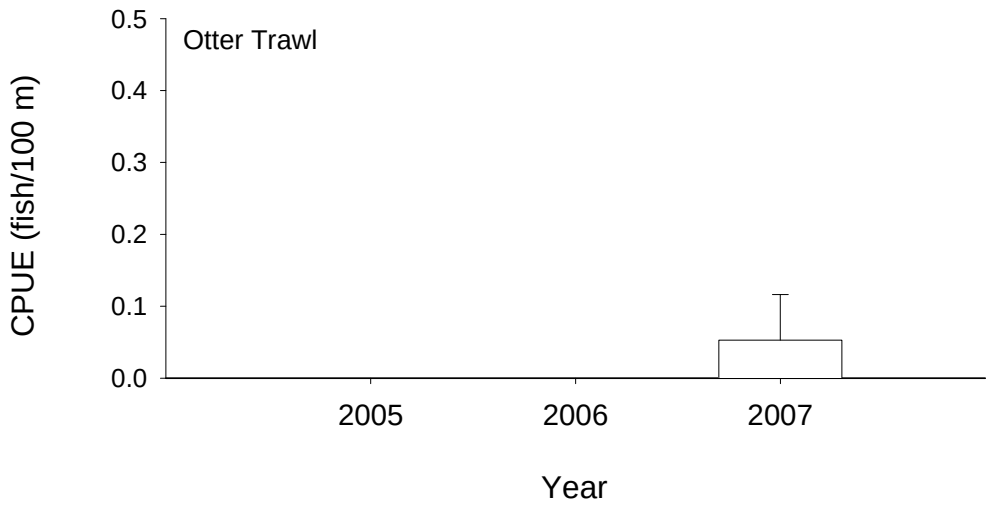

Figure 26. Mean annual catch-per-unit-effort (+/- 2SE) of speckled chub using otter trawls in segment 11, the Kansas River, during sturgeon season 2006 -2007.

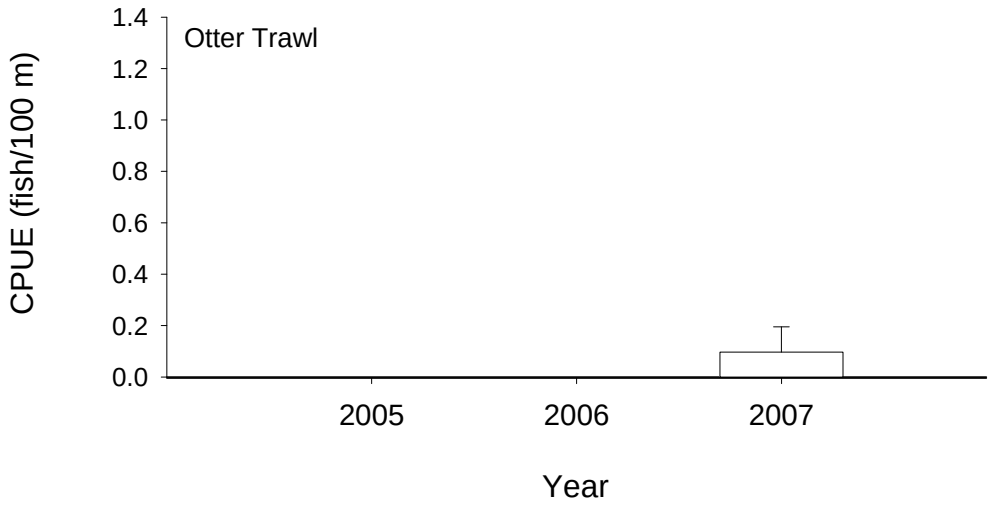

Figure 27. Mean annual catch-per-unit-effort (+/- 2SE) of speckled chub in segment 11, the Kansas River, during fish community season 2006 -2007.

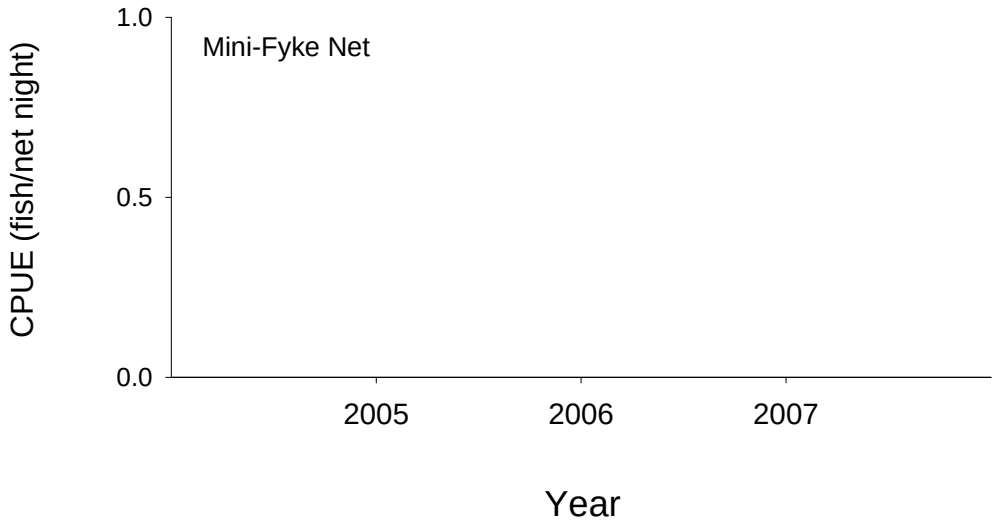

Figure 28. Mean annual catch-per-unit-effort (+/- 2SE) of speckled chub using mini-fyke nets in segment 11, the Kansas River, during fish community season 2006 -2007.

Table 30. Total number of speckled chubs captured for each gear during each season and the proportion caught within each macrohabitat type in segment 11, the Kansas River, during 2006 – 2007. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. N-E indicates the habitat is non-existent in the segment.

Gear	N	Macrohabitat													
		BRAD	CHXO	CONF	DEND	DRNG	ISB	OSB	SCCL	SCCS	SCCN	TRIB	TRML	TRMS	WILD
Sturgeon Season (Fall through Spring)															
1 Inch Trammel Net	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	.	0	28	0	0	0	58	12	2	0	0	0	0	0	0
Gill Net	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	.	0	17	0	0	0	27	50	7	0	0	0	0	0	0
Otter Trawl	3	0	0	0	0	0	67	33	0	0	0	0	0	0	0
	.	0	16	0	0	0	55	24	5	0	0	0	0	0	0
Fish Community Season (Summer)															
1 Inch Trammel Net	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	.	0	8	0	0	0	63	22	7	0	0	0	0	0	0
Mini-Fyke Net	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	.	0	25	0	0	0	46	29	0	0	0	0	0	0	0
Otter Trawl	4	0	25	0	0	0	50	0	25	0	0	0	0	0	0
	.	0	19	0	0	0	47	28	6	0	0	0	0	0	0

Table 31. Total number of speckled chubs captured for each gear during each season and the proportion caught within each mesohabitat type in segment 11, the Kansas River, during 2006 – 2007. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. N-E indicates the habitat is non-existent in the segment.

Gear	N	**Mesohabitat**					
		BAR	CHNB	DTWT	ITIP	POOL	TLWG
Sturgeon Season (Fall through Spring)							
1 Inch Trammel Net	0	0	0	0	0	0	0
	.	0	90	0	10	0	0
Gill Net	0	0	0	0	0	0	0
	.	0	88	0	3	8	0
Otter Trawl	3	0	100	0	0	0	0
	.	0	97	0	3	0	0
Fish Community Season (Summer)							
1 Inch Trammel Net	0	0	0	0	0	0	0
	.	0	93	0	7	0	0
Mini-Fyke Net	0	0	0	0	0	0	0
	.	100	0	0	0	0	0
Otter Trawl	4	0	50	0	50	0	0
	.	0	87	0	13	0	0

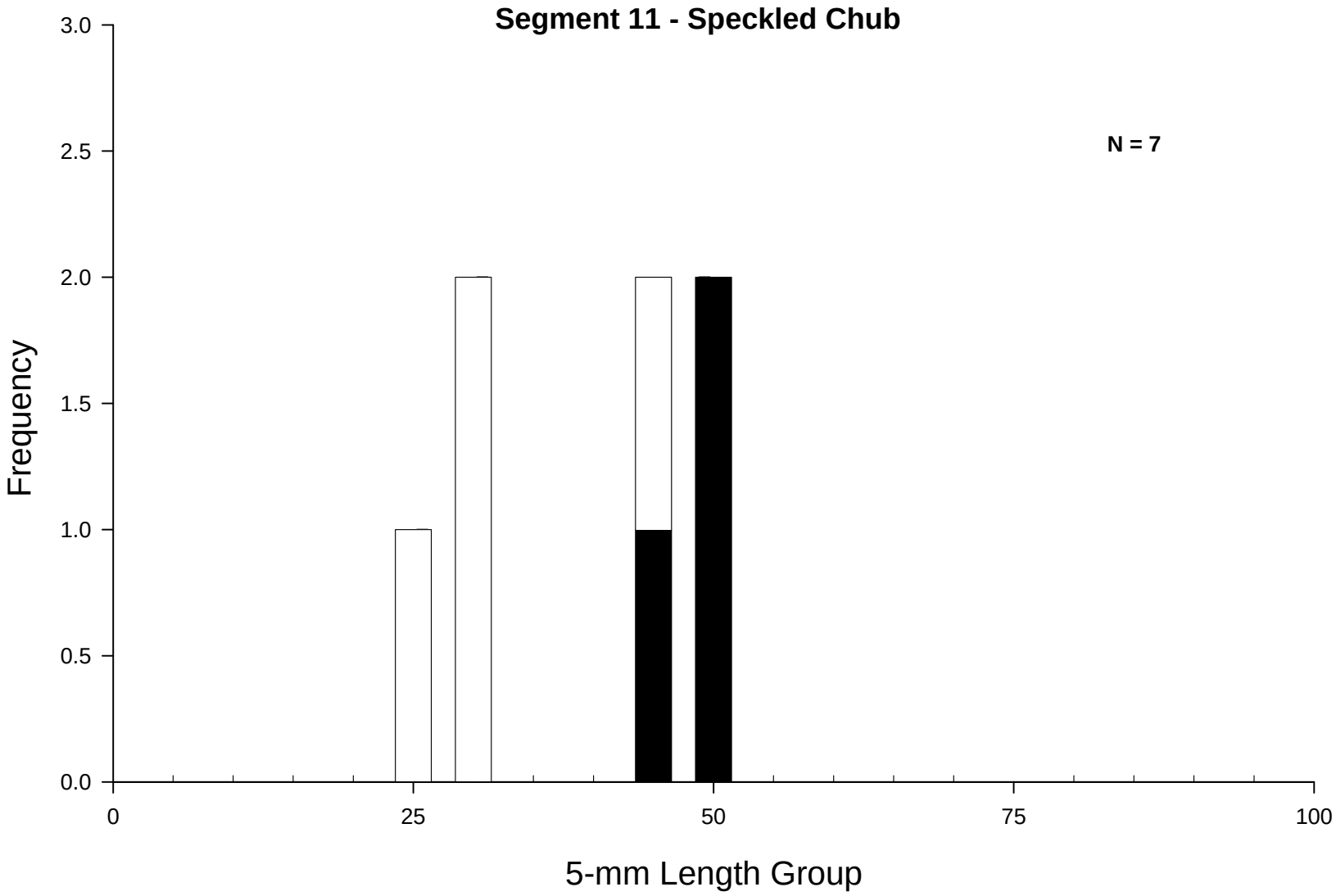

Figure 29. Length frequency of speckled chubs during fall through spring (sturgeon season, black bars) and summer (fish community season, white bars) in segment 11, the Kansas River, during 2006 - 2007.

Sand Shiner

A total of 191 sand shiners was captured in segment 11 during the 2007 sampling season, making them the second most frequently-captured target species. They were present in all three bends sampled, both above and below the Johnson County Weir. This is an increase in the catch from 2006 (N = 95). Mini-fyke nets were the most effective standard gear at capturing sand shiners. Of the 24 net-nights sampled using this gear, sand shiners were collected in 17, for an average of 7.708 fish/ net night (n = 185). Though this is an increase in individuals from 2006, the CPUE was higher last year at 8.5 fish/ net night (Figure 32).

Otter trawls also captured sand shiners, with an overall average of 0.068 fish/ net night, a decrease from 2006 (0.588 fish/ net night). Slightly more fish were captured in otter trawls during the 2007 sturgeon season (N =4, 0.084 fish/ net night) than during fish community season (N = 2; 0.053 fish/ net night; Figures 30 and 31).

Total fish lengths during sturgeon season and fish community season ranged from 42 – 58 and 22 – 54 mm, respectively (Figure 33). The sand shiners were found throughout the river in channel cross-over, inside bend, outside bend, and secondary side channels (Table 32). Most sand shiners were found in shallow (< 1.2 m) water bar habitats (Table 33).

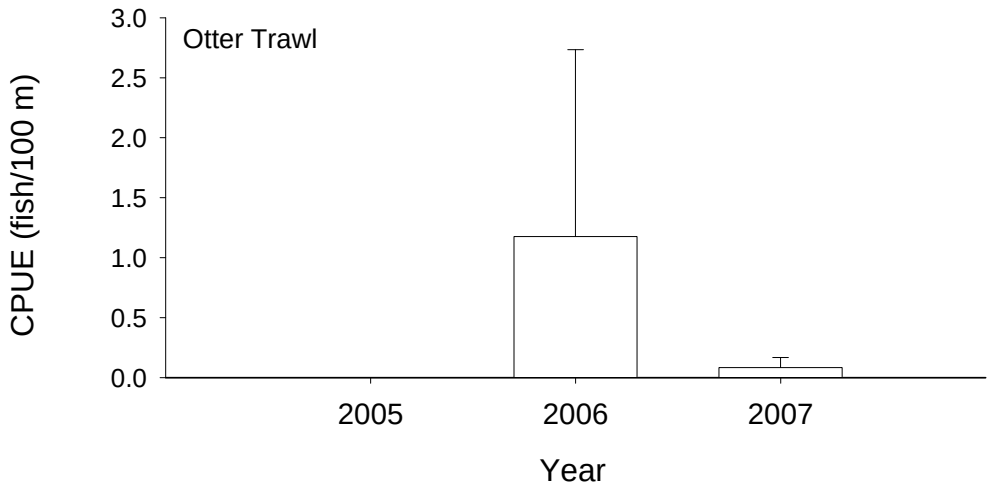

Figure 30. Mean annual catch-per-unit-effort (+/- 2SE) of sand shiner with otter trawls in segment 11, the Kansas River, during sturgeon season 2006 -2007.

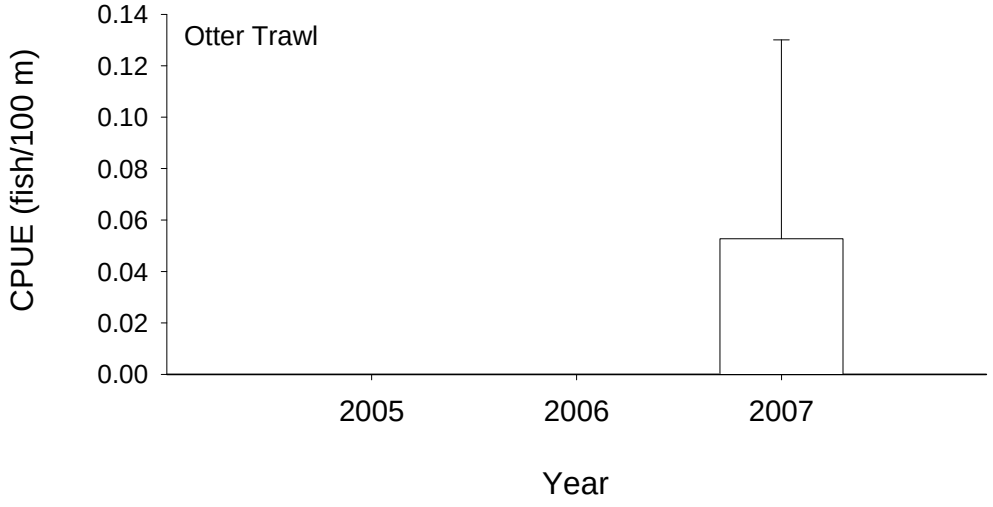

Figure 31. Mean annual catch-per-unit-effort (+/- 2SE) of sand shiner with otter trawls in segment 11, the Kansas River, during fish community season 2006 -2007.

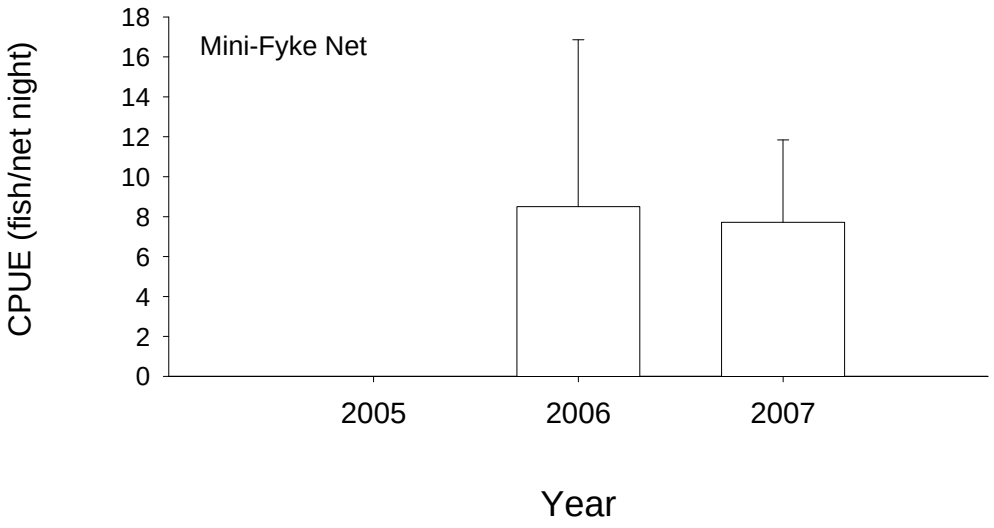

Figure 32. Mean annual catch-per-unit-effort (+/- 2SE) of sand shiner with mini-fyke nets in segment 11, the Kansas River, during fish community season 2006 - 2007.

Table 32. Total number of sand shiners captured for each gear during each season and the proportion caught within each macrohabitat type in segment 11, the Kansas River, during 2006 – 2007. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. N-E indicates the habitat is non-existent in the segment.

Gear	N	Macrohabitat													
		BRAD	CHXO	CONF	DEND	DRNG	ISB	OSB	SCCL	SCCS	SCCN	TRIB	TRML	TRMS	WILD
Sturgeon Season (Fall through Spring)															
1 Inch Trammel Net	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	.	0	28	0	0	0	58	12	2	0	0	0	0	0	0
Gill Net	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	.	0	17	0	0	0	27	50	7	0	0	0	0	0	0
Otter Trawl	4	0	50	0	0	0	0	25	25	0	0	0	0	0	0
	.	0	16	0	0	0	55	24	5	0	0	0	0	0	0
Fish Community Season (Summer)															
1 Inch Trammel Net	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	.	0	8	0	0	0	63	22	7	0	0	0	0	0	0
Mini-Fyke Net	185	0	35	0	0	0	41	25	0	0	0	0	0	0	0
	.	0	25	0	0	0	46	29	0	0	0	0	0	0	0
Otter Trawl	2	0	100	0	0	0	0	0	0	0	0	0	0	0	0
	.	0	19	0	0	0	47	28	6	0	0	0	0	0	0

Table 33. Total number of sand shiners captured for each gear during each season and the proportion caught within each mesohabitat type in segment 11, the Kansas River, during 2006 – 2007. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. N-E indicates the habitat is non-existent in the segment.

Gear	N	**Mesohabitat**					
		BAR	CHNB	DTWT	ITIP	POOL	TLWG
Sturgeon Season (Fall through Spring)							
1 Inch Trammel Net	0	0	0	0	0	0	0
	.	0	90	0	10	0	0
Gill Net	0	0	0	0	0	0	0
	.	0	88	0	3	8	0
Otter Trawl	4	0	100	0	0	0	0
	.	0	97	0	3	0	0
Fish Community Season (Summer)							
1 Inch Trammel Net	0	0	0	0	0	0	0
	.	0	93	0	7	0	0
Mini-Fyke Net	185	100	0	0	0	0	0
	.	100	0	0	0	0	0
Otter Trawl	2	0	50	0	50	0	0
	.	0	87	0	13	0	0

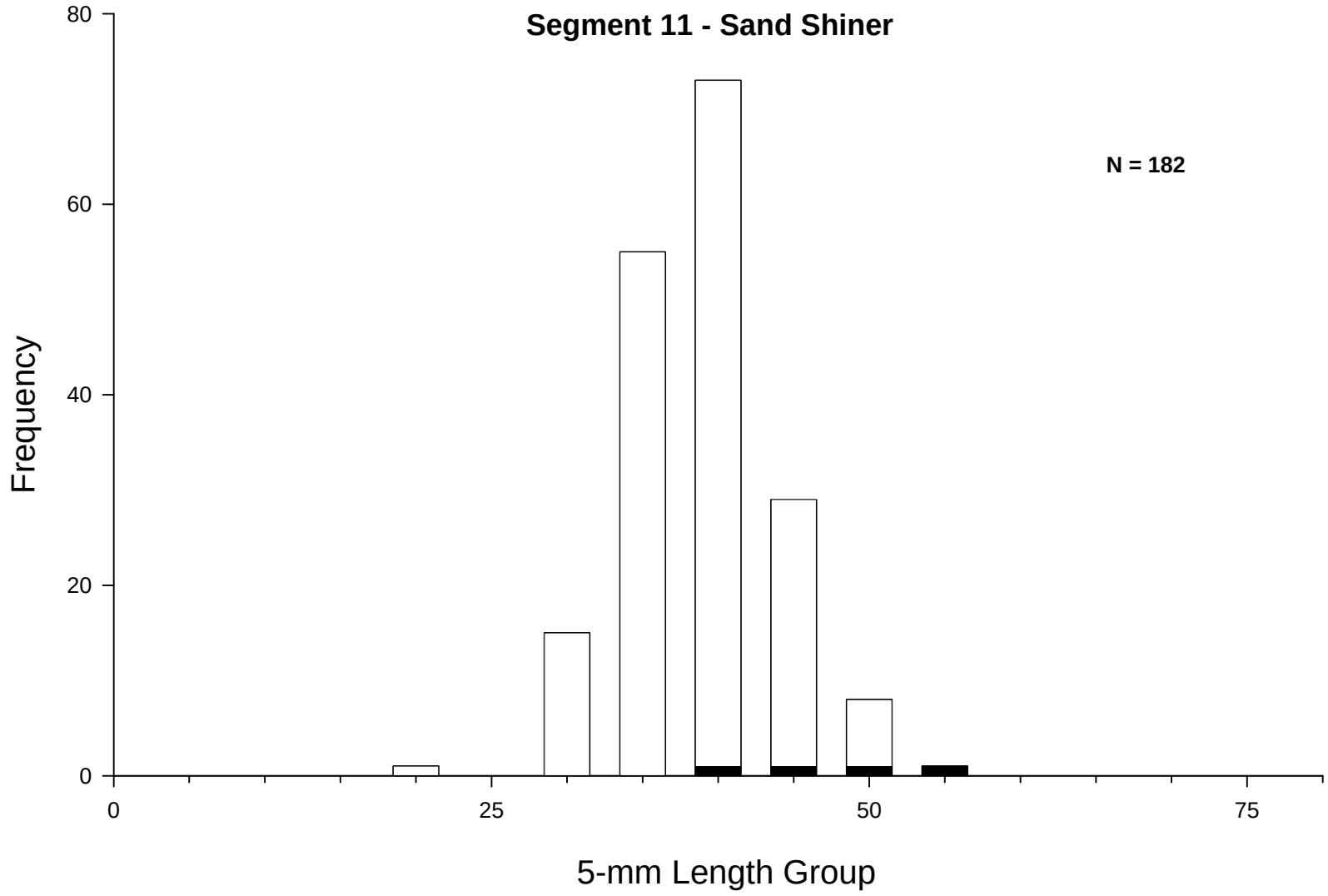

Figure 33. Length frequency of sand shiners during fall through spring (sturgeon season, black bars) and summer (fish community season, white bars) in segment 11, the Kansas River, during 2006 - 2007.

***Hybognathus* spp**.

There was a total of four *Hybognathus* spp. sampled in segment 11 during 2007, while none was sampled in 2006. Species include the plains minnow (N = 3) and one unidentified *Hybognathus* (N = 1) fish. These fish were captured in mini-fyke nets, with a catch-per-unit effort of 0.167 fish/ net night (Figure 36). Lengths ranged from 35 – 54 mm (Figure 37). Three of the four fish were captured in the channel cross-over, while one was captured in the inside bend (Figure 34). All sand shiners were captured in shallow water (< 1.2 m) bar habitats (Figure 35).

Segment 11 - *Hybognathus* spp. / Sturgeon Season

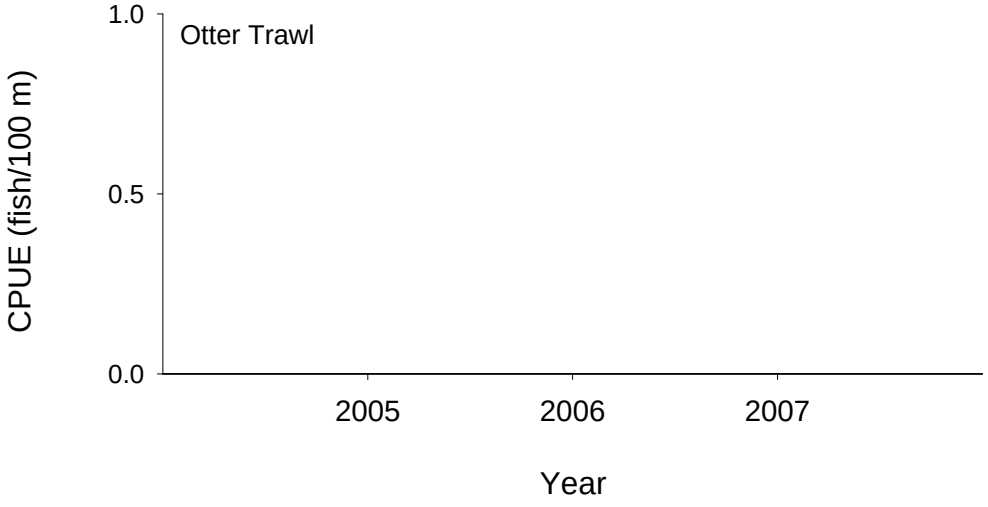

Figure 34. Mean annual catch-per-unit-effort (+/- 2SE) of *Hybognathus* spp. with otter trawls in segment 11, the Kansas River, during sturgeon season 2006 - 2007.

Segment 11 - *Hybognathus* spp. / Fish Community Season

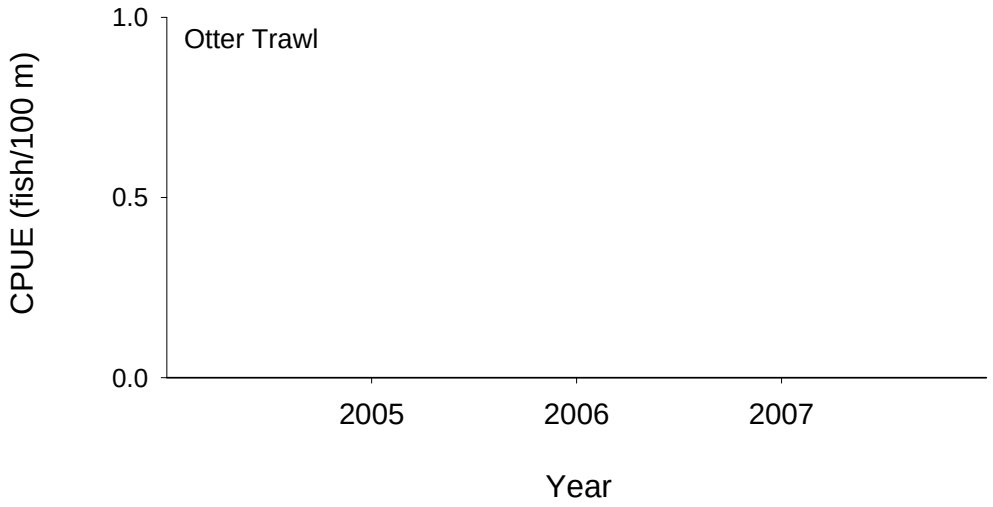

Figure 35. Mean annual catch-per-unit-effort (+/- 2SE) of *Hybognathus* spp. with otter trawls in segment 11, the Kansas River, during fish community season 2006 - 2007.

Segment 11 - *Hybognathus* spp. / Fish Community Season

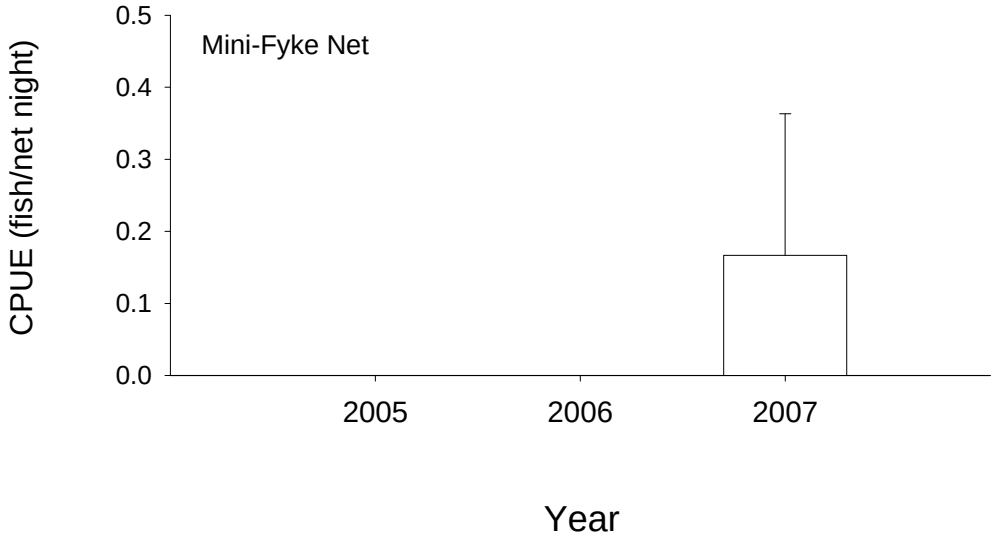

Figure 36. Mean annual catch-per-unit-effort (+/- 2SE) of *Hybognathus* spp. with mini-fyke nets in segment 11, the Kansas River, during fish community season 2006 - 2007.

Table 34. Total number of *Hybognathus* spp. captured for each gear during each season and the proportion caught within each macrohabitat type in segment 11, the Kansas River, during 2006 – 2007. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. N-E indicates the habitat is non-existent in the segment.

Gear	N	**Macrohabitat**													
		BRAD	CHXO	CONF	DEND	DRNG	ISB	OSB	SCCL	SCCS	SCCN	TRIB	TRML	TRMS	WILD
Sturgeon Season (Fall through Spring)															
1 Inch Trammel Net	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	.	0	28	0	0	0	58	12	2	0	0	0	0	0	0
Gill Net	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	.	0	17	0	0	0	27	50	7	0	0	0	0	0	0
Otter Trawl	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	.	0	16	0	0	0	55	24	5	0	0	0	0	0	0
Fish Community Season (Summer)															
1 Inch Trammel Net	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	.	0	8	0	0	0	63	22	7	0	0	0	0	0	0
Mini-Fyke Net	4	0	75	0	0	0	25	0	0	0	0	0	0	0	0
	.	0	25	0	0	0	46	29	0	0	0	0	0	0	0
Otter Trawl	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	.	0	19	0	0	0	47	28	6	0	0	0	0	0	0

Table 35. Total number of *Hybognathus* spp. captured for each gear during each season and the proportion caught within each mesohabitat type in segment 11, the Kansas River, during 2006 – 2007. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. N-E indicates the habitat is non-existent in the segment.

Gear	N	**Mesohabitat**					
		BAR	CHNB	DTWT	ITIP	POOL	TLWG
Sturgeon Season (Fall through Spring)							
1 Inch Trammel Net	0	0	0	0	0	0	0
	.	0	90	0	10	0	0
Gill Net	0	0	0	0	0	0	0
	.	0	88	0	3	8	0
Otter Trawl	0	0	0	0	0	0	0
	.	0	97	0	3	0	0
Fish Community Season (Summer)							
1 Inch Trammel Net	0	0	0	0	0	0	0
	.	0	93	0	7	0	0
Mini-Fyke Net	4	100	0	0	0	0	0
	.	100	0	0	0	0	0
Otter Trawl	0	0	0	0	0	0	0
	.	0	87	0	13	0	0

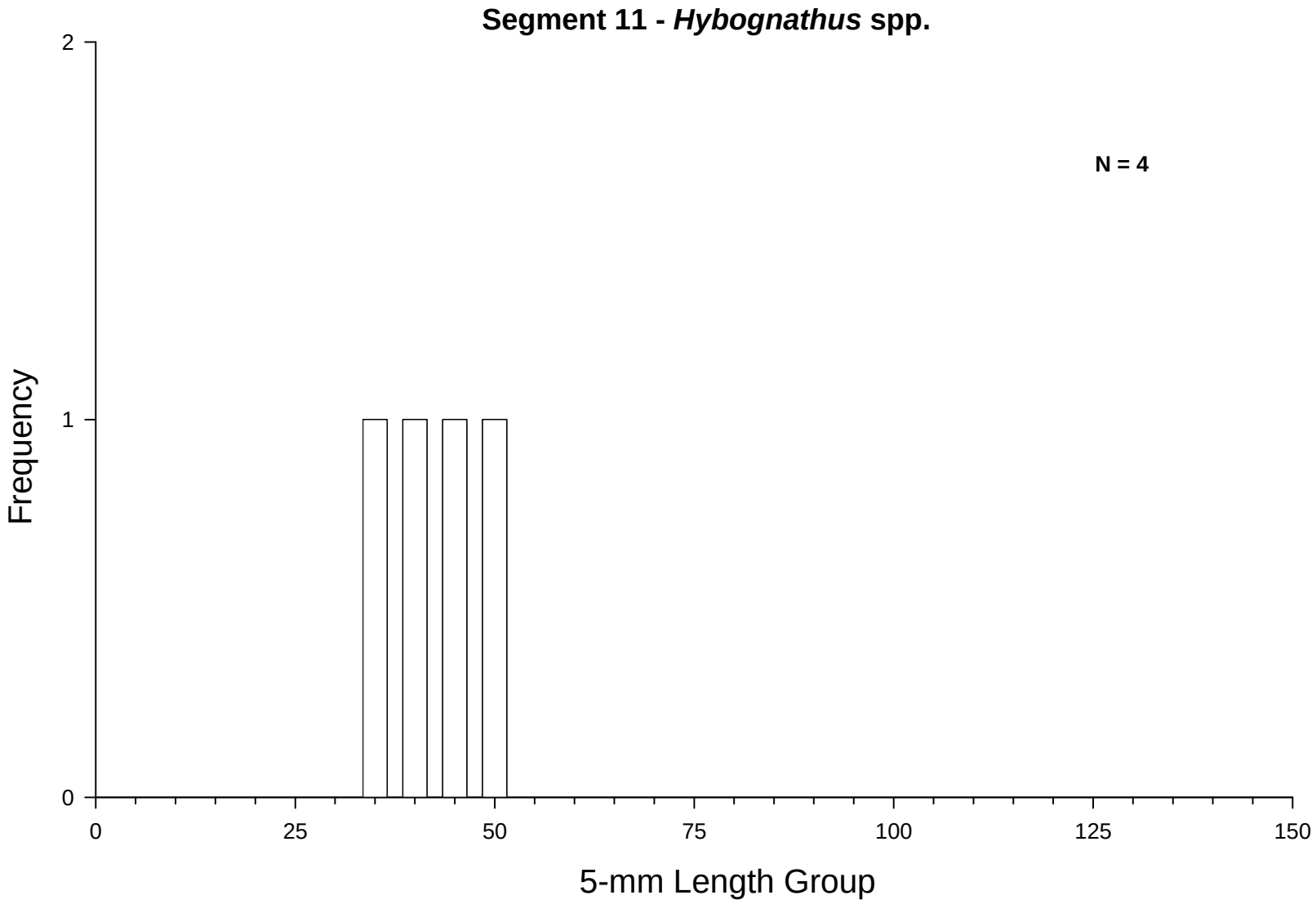

Figure 37. Length frequency of *Hybognathus* spp. caught during fall through spring (sturgeon season, black bars) and summer (fish community season, white bars) in segment 11, the Kansas River, during 2006 - 2007.

Blue Sucker

A total of 25 blue suckers was captured in segment 11 during 2007 sampling season, an increase from the catch in 2006 (N = 6). Fish were most effectively captured in gill nets with an average of 0.375 fish/ net night (N = 21; Figure 38). Trammel nets captured four blue suckers at a rate of 0.047 fish/ m (Appendix F). More were captured in sturgeon season (N = 3) than in fish community season (N = 1; Figures 39 and 41). The catch of individual blue suckers in 2006 was lower (N = 2) than in 2007, but the CPUE was higher (0.296 fish/ m). Total lengths ranged from 610 – 732 mm (Figure 44), a larger range than was captured in 2006 (581 – 697 mm). Blue suckers were captured in channel cross-overs, inside bends, outside bends, and a connected secondary side channel (Figure 36). Gill nets captured blue suckers in a variety of mesohabitats, including channel border, island tip, and deeper-water pools (Table 37).

Segment 11 - Blue Sucker / Sturgeon Season

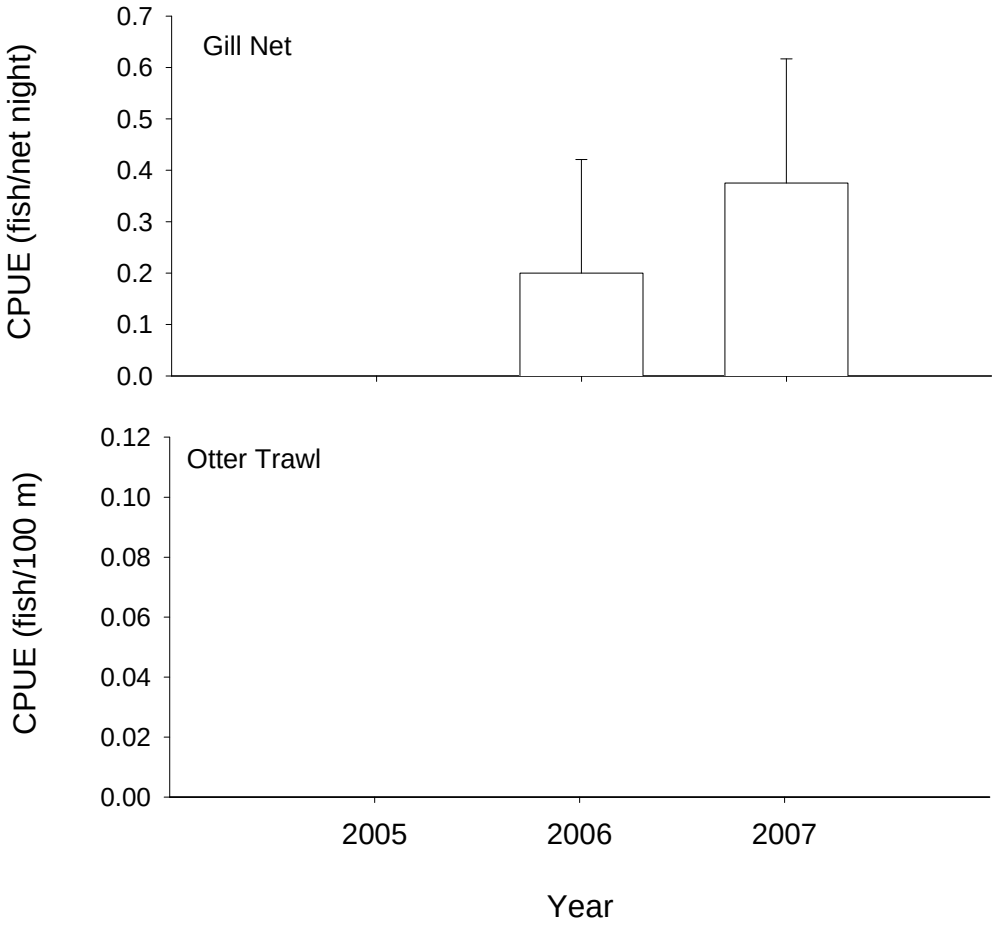

Figure 38. Mean annual catch-per-unit-effort (+/- 2SE) of blue sucker with gill nets and otter trawls in segment 11, the Kansas River, during sturgeon season 2006 - 2007.

Segment 11 - Blue Sucker / Sturgeon Season

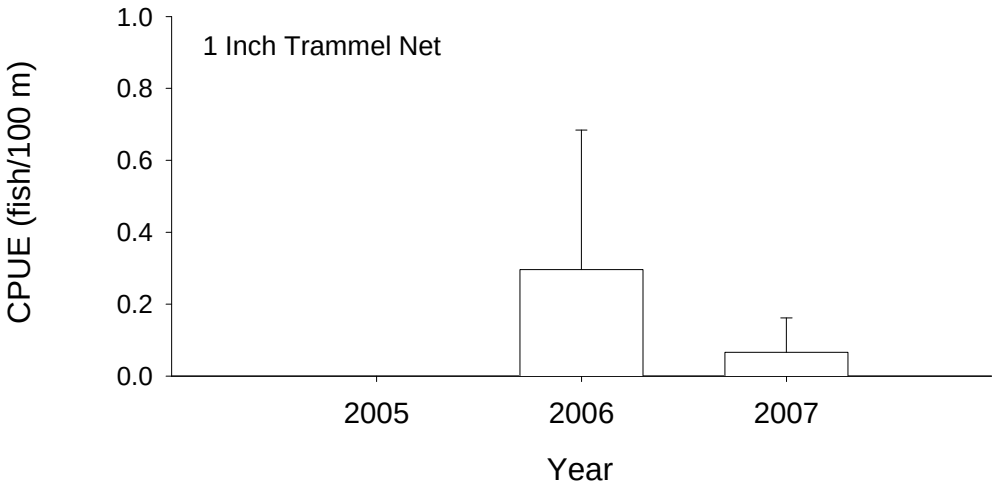

Figure 39. Mean annual catch-per-unit-effort (+/- 2SE) of blue sucker with 1 inch trammel nets in segment 11, the Kansas River, during sturgeon season 2006 - 2007.

Segment 11 - Blue Sucker / Fish Community Season

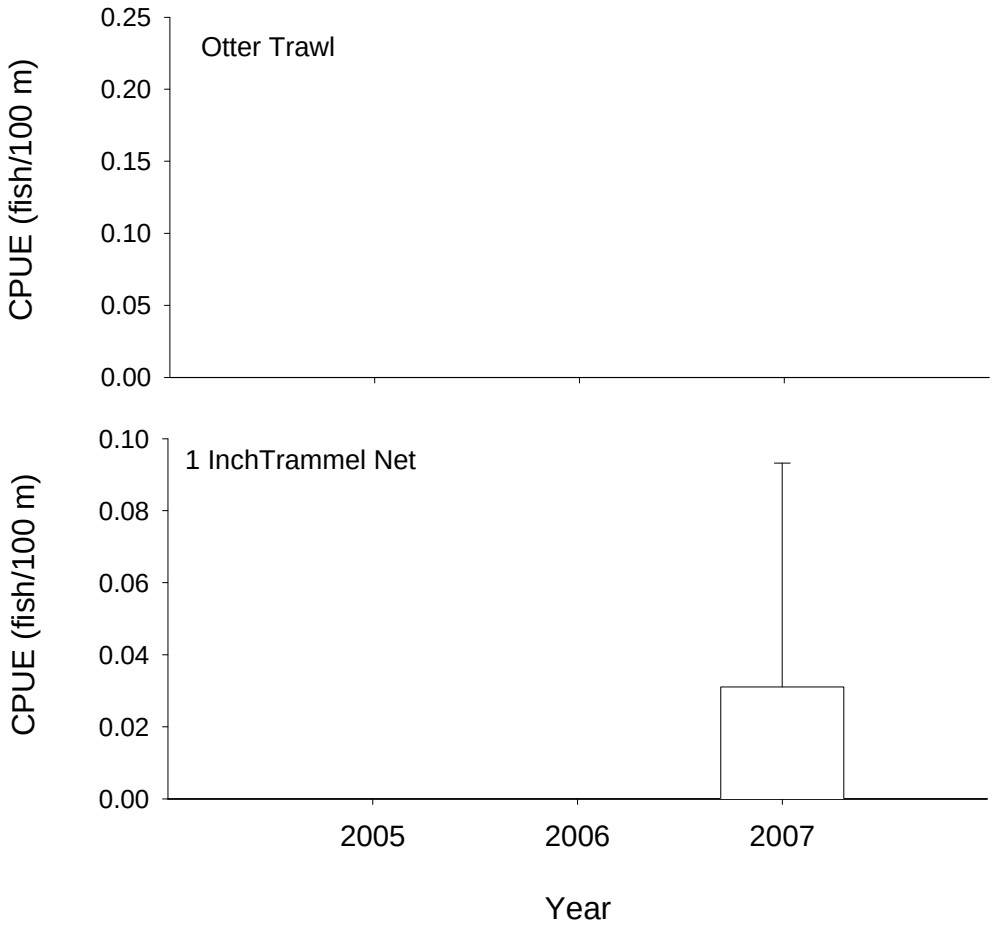

Figure 41. Mean annual catch-per-unit-effort (+/- 2SE) of blue sucker using otter trawls and 1 inch trammel nets in segment 11, the Kansas River, during fish community season 2006 - 2007.

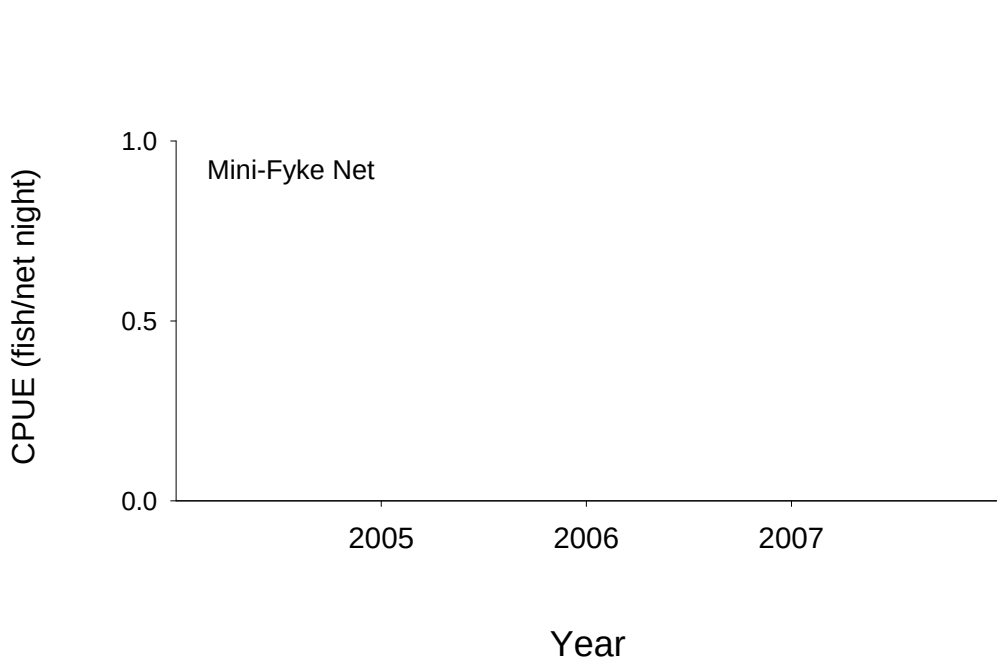

Figure 42. Mean annual catch-per-unit-effort (+/- 2SE) of blue suckers using mini-fyke nets in segment 11, the Kansas River, during fish community season 2006 - 2007.

Table 36. Total number of blue suckers captured for each gear during each season and the proportion caught within each macrohabitat type in segment 11, the Kansas River, during 2006 – 2007. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. N-E indicates the habitat is non-existent in the segment.

Gear	N	Macrohabitat													
		BRAD	CHXO	CONF	DEND	DRNG	ISB	OSB	SCCL	SCCS	SCCN	TRIB	TRML	TRMS	WILD
Sturgeon Season (Fall through Spring)															
1 Inch Trammel Net	3	0	67	0	0	0	33	0	0	0	0	0	0	0	0
	.	0	28	0	0	0	58	12	2	0	0	0	0	0	0
Gill Net	21	0	24	0	0	0	0	38	38	0	0	0	0	0	0
	.	0	17	0	0	0	27	50	7	0	0	0	0	0	0
Otter Trawl	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	.	0	16	0	0	0	55	24	5	0	0	0	0	0	0
Fish Community Season (Summer)															
1 Inch Trammel Net	1	0	0	0	0	0	0	100	0	0	0	0	0	0	0
	.	0	8	0	0	0	63	22	7	0	0	0	0	0	0
Mini-Fyke Net	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	.	0	25	0	0	0	46	29	0	0	0	0	0	0	0
Otter Trawl	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	.	0	19	0	0	0	47	28	6	0	0	0	0	0	0

Table 37. Total number of blue suckers captured for each gear during each season and the proportion caught within each mesohabitat type in segment 11, the Kansas River, during 2006 – 2007. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. N-E indicates the habitat is non-existent in the segment.

Gear	N	Mesohabitat					
		BAR	CHNB	DTWT	ITIP	POOL	TLWG
Sturgeon Season (Fall through Spring)							
1 Inch Trammel Net	3	0	100	0	0	0	0
	.	0	90	0	10	0	0
Gill Net	21	0	76	0	14	10	0
	.	0	88	0	3	8	0
Otter Trawl	0	0	0	0	0	0	0
	.	0	97	0	3	0	0
Fish Community Season (Summer)							
1 Inch Trammel Net	1	0	100	0	0	0	0
	.	0	93	0	7	0	0
Mini-Fyke Net	0	0	0	0	0	0	0
	.	100	0	0	0	0	0
Otter Trawl	0	0	0	0	0	0	0
	.	0	87	0	13	0	0

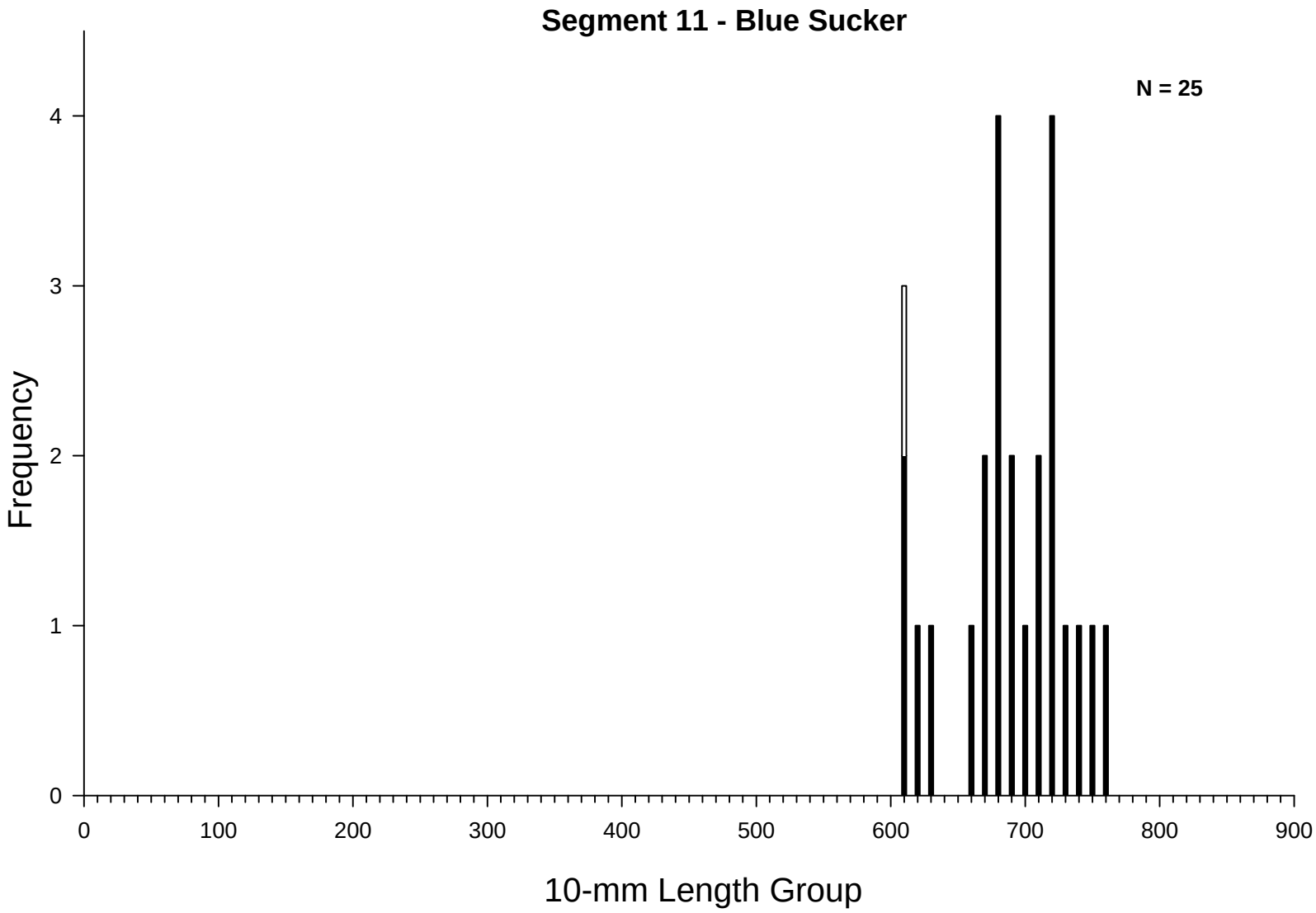

Figure 44. Length frequency of blue suckers during fall through spring (sturgeon season, black bars) and summer (fish community season, white bars) in segment 11, the Kansas River, during 2006 - 2007.

Sauger

Only three sauger were captured in segment 11 during the 2007 sampling season, which is equal to catch in 2006. No sauger were captured in the one bend sampled above the Johnson County Weir. Fish were captured in gill nets (N = 1) and trammel nets (N = 2; Figures 45, 46, and 48). Overall trammel net CPUE decreased from 0.156 fish/ m in 2006, to 0.026 fish/ m in 2007. No sauger were captured in otter trawls in 2007. Sauger were captured from channel borders and inside bend habitats (Tables 38 and 39).

Segment 11 - Sauger / Sturgeon Season

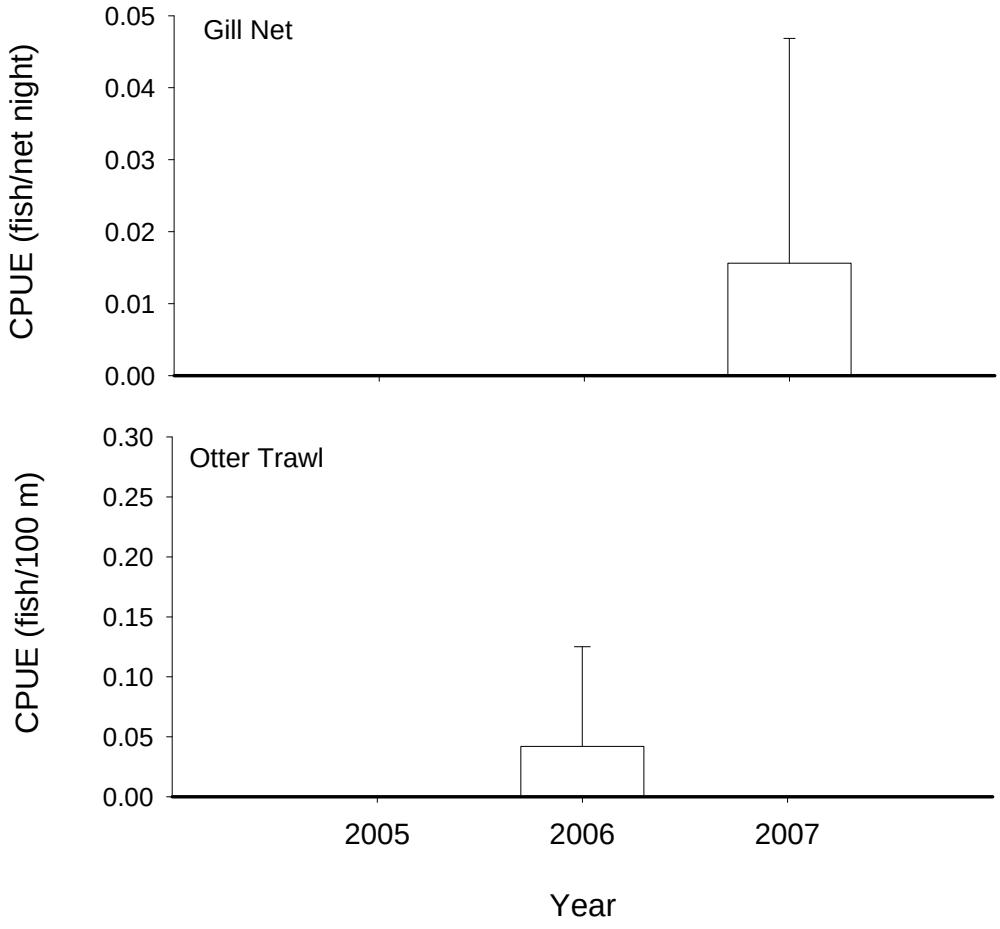

Figure 45. Mean annual catch-per-unit-effort (+/- 2SE) of sauger using gill nets and otter trawls in segment 11, the Kansas River, during sturgeon season 2006 - 2007.

Segment 11 - Sauger / Sturgeon Season

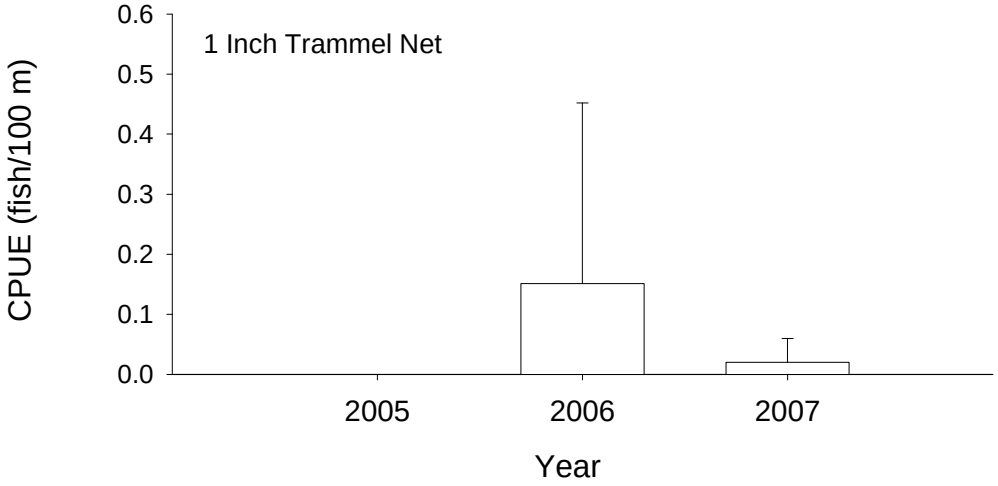

Figure 46. Mean annual catch-per-unit-effort (+/- 2SE) of sauger using 1 and 2.5 inch trammel nets in segment 11, the Kansas River, during sturgeon season 2006 - 2007.

Segment 11 - Sauger / Fish Community Season

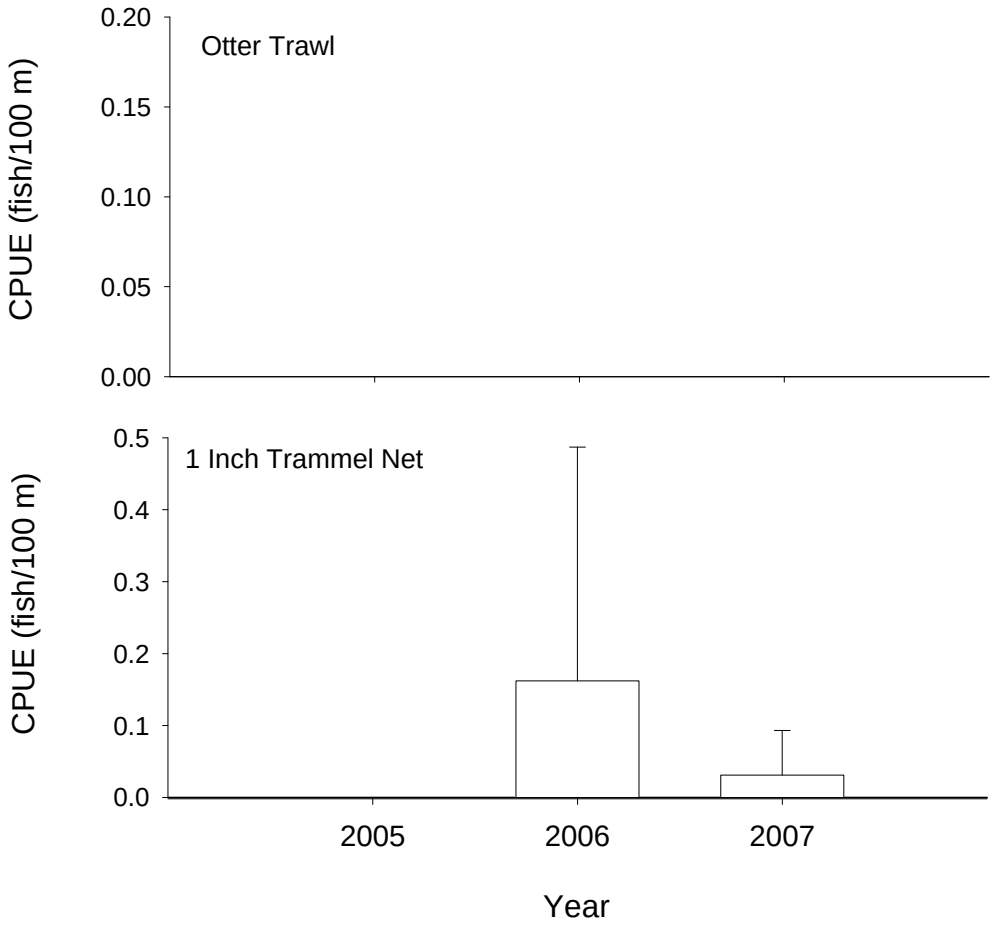

Figure 48. Mean annual catch-per-unit-effort (+/- 2SE) of sauger using otter trawls and 1 inch trammel nets in segment 11, the Kansas River, during fish community season 2006 - 2007.

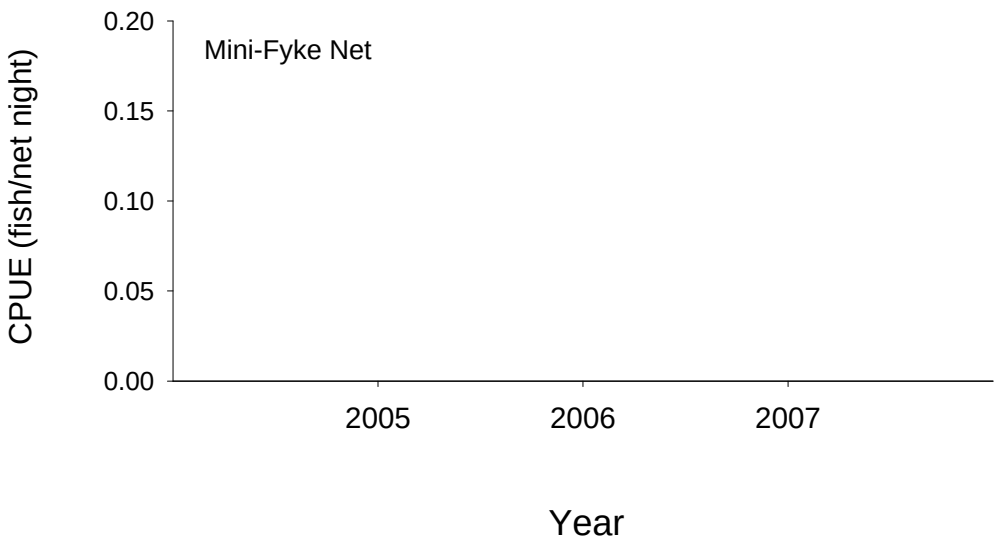

Figure 49. Mean annual catch-per-unit-effort (+/- 2SE) of sauger using mini-fyke nets in segment 11, the Kansas River, during fish community season 2006 - 2007.

Table 38. Total number of sauger captured for each gear during each season and the proportion caught within each macrohabitat type in segment 11, the Kansas River, during 2006 – 2007. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. N-E indicates the habitat is non-existent in the segment.

Gear	N	Macrohabitat													
		BRAD	CHXO	CONF	DEND	DRNG	ISB	OSB	SCCL	SCCS	SCCN	TRIB	TRML	TRMS	WILD
Sturgeon Season (Fall through Spring)															
1 Inch Trammel Net	1	0	100	0	0	0	0	0	0	0	0	0	0	0	0
	.	0	28	0	0	0	58	12	2	0	0	0	0	0	0
Gill Net	1	0	0	0	0	0	0	100	0	0	0	0	0	0	0
	.	0	17	0	0	0	27	50	7	0	0	0	0	0	0
Otter Trawl	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	.	0	16	0	0	0	55	24	5	0	0	0	0	0	0
Fish Community Season (Summer)															
1 Inch Trammel Net	1	0	0	0	0	0	100	0	0	0	0	0	0	0	0
	.	0	8	0	0	0	63	22	7	0	0	0	0	0	0
Mini-Fyke Net	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	.	0	25	0	0	0	46	29	0	0	0	0	0	0	0
Otter Trawl	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	.	0	19	0	0	0	47	28	6	0	0	0	0	0	0

Table 39. Total number of sauger captured for each gear during each season and the proportion caught within each mesohabitat type in segment 11, the Kansas River, during 2006 – 2007. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. N-E indicates the habitat is non-existent in the segment.

Gear	N	Mesohabitat					
		BAR	CHNB	DTWT	ITIP	POOL	TLWG
Sturgeon Season (Fall through Spring)							
1 Inch Trammel Net	1	0	100	0	0	0	0
	.	0	90	0	10	0	0
Gill Net	1	0	100	0	0	0	0
	.	0	88	0	3	8	0
Otter Trawl	0	0	0	0	0	0	0
	.	0	97	0	3	0	0
Fish Community Season (Summer)							
1 Inch Trammel Net	1	0	100	0	0	0	0
	.	0	93	0	7	0	0
Mini-Fyke Net	0	0	0	0	0	0	0
	.	100	0	0	0	0	0
Otter Trawl	0	0	0	0	0	0	0
	.	0	87	0	13	0	0

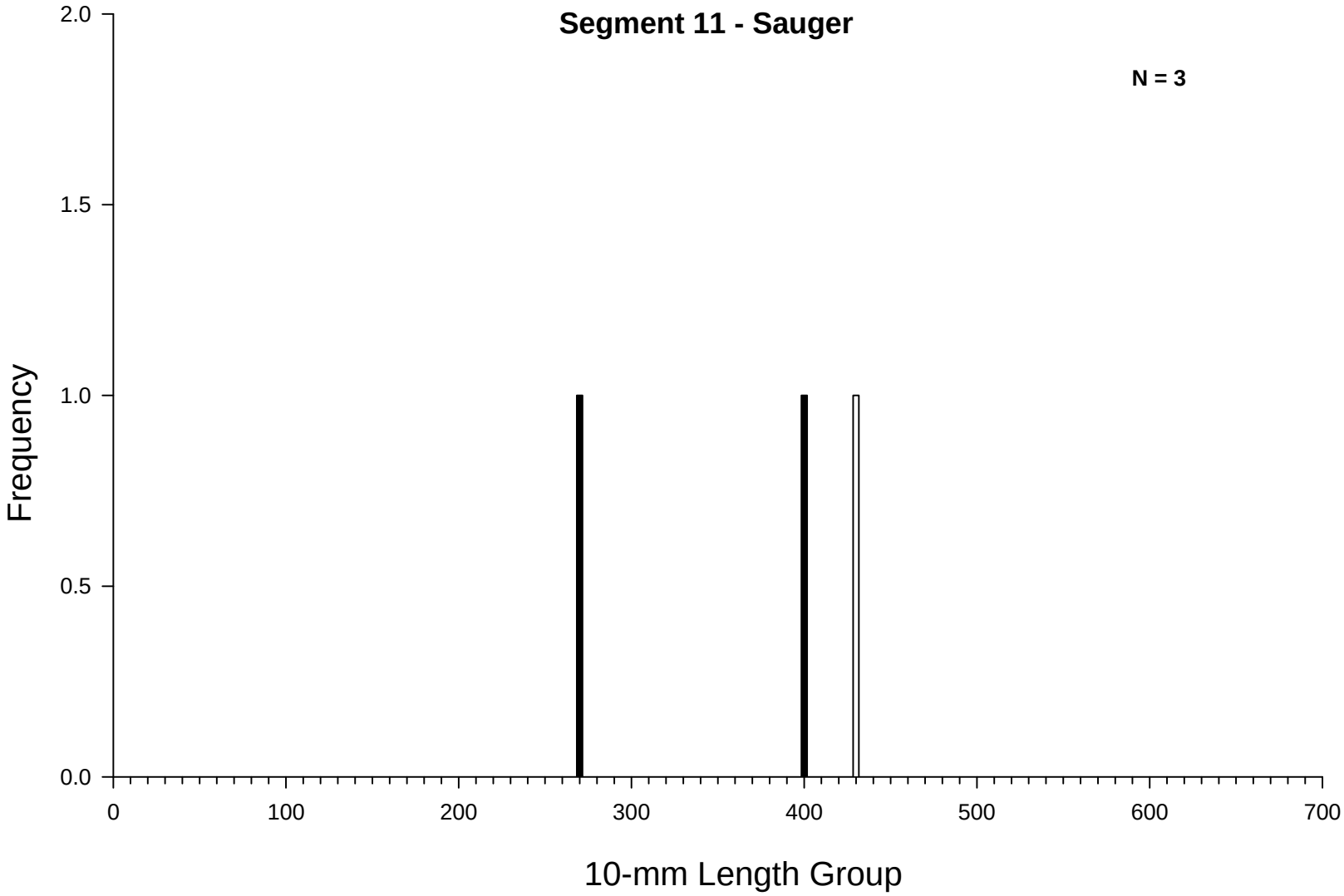

Figure 51. Length frequency of sauger during fall through spring (sturgeon season, black bars) and summer (fish community season, white bars) in segment 11, the Kansas River, during 2006 - 2007.

Missouri River Fish Community

Objective 6. Document annual results and long-term trends of all non-target species population abundance and geographic distribution throughout the Missouri River system, where sample size is greater than fifty individuals.

A total of 3,254 fish representing 45 species was captured in Segment 11 in all standard gear types during the 2007 season. Nine non-target species were represented by at least 50 individuals with non-target species comprising 76% of the total catch, which is a slight reduction (82%) from 2006. All mini-fyke nets were deployed in BARS mesohabitats; this accounted for 60% (54% in 2006) of the total catch. Channel border and POOL mesohabitats produced 33 (44% in 2006) and 2% (2.5% in 2006), respectively. Gears deployed in BARS mesohabitats captured slightly fewer species (30) than those deployed in CHNB mesohabitats (32) but more were captured than in 2006 (21 and 25 %, respectively).

Gill nets captured 20 species (only 13 in 2006) in 60 net nights with five of those represented by more than 50 individuals (Appendix F1). Gill nets captured the largest specimens of gizzard shad (266 – 362 mm) and blue catfish (438 – 815 mm) with CPUE's = 0.16 and 0.13 fish/net night, respectively. One-inch trammel nets captured 17 species with four species represented by at least 50 fish. (Appendix F2). Larger individuals of river carpsucker (392 – 545 mm) and channel catfish (219 – 667 mm) (CPUE = 0.14 and 0.1, fish/100 m, respectively) were captured with one-inch trammel nets. Otter trawls captured 20 species (15 species in 2006) including eight non-target species with more than 50 individuals (Appendix F4). Channel catfish, blue catfish, and freshwater drum (CPUE = 3.39, 2.15, and 0.64 fish/100 m, respectively) were most effectively captured with otter trawls. Notable captures in otter trawl were one quillback sucker, a slenderhead darter, a shorthead redhorse, and one stonecat. Mini-fyke nets captured 30 species (21 species in 2006) in 24 net nights, including eight species represented by at least 50 individuals (Appendix F6). Mini-fyke nets were the most effective gear to sample the following five non-target Kansas River species (CPUE = number of fish/net night): red shiner = 37.96, gizzard shad = 9.04, river carpsucker = 6.23, bullhead minnow = 5.50, emerald shiner = 2.60, and green sunfish = 2.33. CPUE's were more than doubled in 2006 compared with 2007.

Discussion

We captured the first pallid sturgeon on record in the Kansas River since 1952 (U.S. Fish and Wildlife Service, 2000). Historic records note five pallid sturgeon were captured near Lawrence, Kansas (river mile 40) (University of Kansas Ichthyological Collection). The fish captured in 2007 was found at river mile 12, approximately 2.7 miles downstream from the Johnson County Weir (weir). The pallid sturgeon was of hatchery origin, from the 2005 year class, and was stocked at Parkville, Missouri in August of 2006. In the seven months the fish was at-large, it traveled a total of 22 miles, going ten miles downstream in the mainstem Missouri River, and 12 miles up the Kansas River.

Within the PSPAP, only seven 2005 year class pallid sturgeon have been captured in RPMA 4 from 2004 – 2006 (Steffenson and Hamel 2007). These were found in segment 9 of the Missouri River, that extends from river mile 595 (confluence of the Platte River) to the confluence of the Kansas River (RM 367). The pallid sturgeon captured in the Kansas River had a slightly higher relative condition (0.881) and length growth rate (0.202 mm/ day) than the other 2005 year class fish (0.86 and 0.15 mm/ day, respectively). The Kansas River pallid sturgeon had a weight growth rate of 0.101 g/ day, where the other 2005 year class fish lost weight, an average of -0.11 g/ day. This could be because the 2005 year class fish were only at-large for an average of 27 days, a much shorter amount of time than the pallid sturgeon captured in the Kansas River. This pallid sturgeon had the opportunity to adjust to river conditions and began to forage, where the recently-stocked 2005 year class fish maybe had not.

A large majority of shovelnose sturgeon sampled in the Kansas River in 2006 and 2007 (94 and 96%, respectively) are preferred size class and above (≥510 mm). This is a higher proportion of large shovelnose sturgeon than found in the Missouri River in the segments surrounding the mouth of the Kansas River. In 2006 and 2007, the percent of shovelnose sturgeon larger than 510 mm was 79 and 73%, respectively (Horner et al 2006, Caton et al 2007). In 2006, 76% of the shovelnose sturgeon in segment 9 were preferred size-class or greater (Steffenson and Hamel 2007). Fifty-one percent of these larger fish were captured during the spring months (April – May). This could potentially be the result of adults (larger fish) migrating up into the Kansas River to spawn, since shovelnose sturgeon are known to travel up tributaries (Bramblett and White 2001).

Few *Macrhybopsis* spp. were captured in the Kansas River since sampling began in 2006 (N = 7). All of these individuals have been captured below the weir. Few chub species are

captured in segment 10 compared to other portions of the Missouri River, which could be explained by the poor water quality associated with urban environments (Herman et al 2008). Water quality studies on the Kansas River have shown less-than-favorable conditions, specifically related to high concentrations of nitrogen and phosphorus (Rasmussen et al. 2005).

Blue sucker catch rate was low in 2006 (N = 6) compared to 2007 (N = 25) in segment 11. A study conducted on the Kansas River from 2005 – 2006 found no blue suckers below the weir and an abundance in the upper portions of the river (Eitzman et al. 2007). The results of minimal sampling effort show only two of these fish have been captured above the weir. This is most likely attributed to the few gear deployments in only one year of sampling above the weir. Only large fish were sampled in the two years of our study (total lengths 581 – 732 mm). The lack of small (i.e., YOY) blue sucker has been noted in the mainstem Missouri River as well (LaBay et al. 2008), and is most likely the result of gear bias.

EVALUATION GEAR

During the 2007 fish community season, PSPAP implemented an evaluation of a small benthic trawl (push trawl) throughout the basin. The push trawl was used to sample water between 0.25 - 2.0 meters and deployed from the bow of a jet outboard powered boat while traveling in a downstream direction. A specialized boom configuration extending from the bow allowed this net to be pushed, rather than towed, along the river bottom. Standard trawl hauls ranged from a minimum distance of 15 m to a maximum distance of 150 m. All push trawls were constructed from 4mm (1/8 inch) nylon mesh, designed with a 2.4 m (8 ft.) headrope, 0.6 m mouth height, and an overall length of 1.8 meters. Paired wooden doors were 762 mm (30in.) x 381 mm (15 in.).

The premise of this push trawl gear evaluation was to measure its effectiveness in sampling the fish community and compare it to the standard otter trawl and standard mini-fyke net catch. From the three bends randomly selected in segment 11 for the 2007 sampling season, two bends were subsequently randomly selected for deployment of the push trawl during fish community season. The net was deployed as any standard gear, with a minimum of eight subsamples with two deployments in each available macrohabitat and mesohabitat combination.

Push trawl and mini-fyke deployments were categorized into three groups. The first classification (A) is where the push trawl was deployed in an area not suitable for mini-fyke and otter trawl deployment. This includes unsuitable areas where standard otter trawl and mini-fyke cannot be deployed according to protocols (Drobish 2007b). The second area (B) is where a mini-fyke net was deployed, but not in an area accessible by the push trawl. These habitats include backwaters, isolated bar scour areas, and areas with woody debris present. Lastly, push trawl was deployed in areas (C) that can be compared to mini-fyke net sets. This area was deemed fishable by both gears.

Morisita's (1959) index of community similarity was selected to measure the catch of area C sampled both by mini-fyke nets and push trawls. Values are generated from zero (dissimilar) to 1 (similar). A value of 0.258 was assigned to the gear comparison. Although these areas were presumed fishable by both gears, clear differences are present in species composition of these two gear types. Mini-fyke nets had greater species diversity but push trawls caught a greater percentage of chub species. Mini-fyke nets captured more sand shiners and *Hybognathus* spp.

Acknowledgments

Funding for PSPAP was provided by the United States Army Corps of Engineers. We would like to thank Mark Drobish for his input, coordination, and administration of the program. Appreciation is extended to Yan Hong for database management expertise and summarization. Much appreciation goes to Angela Waits, Carol Lutes, Jenny Mosley, Joyce Baker, Lauren Williamson, Leslie Cook, Verna Hawkins, and Stephanie Nickell for data entry, creation of annual report tables and figures, and field assistance. Assistance with the development of the template for this annual report was by Nick Utrup. SAS© code development was provided by Sherry Gao. Primary field assistance and data collection were provided by Jason Dattilo, Erin Gilmore, Marcus Miller, Ryan Dirnberger, Patricia Herman, David Garrett, Cindy Shaffer, Kasey Whiteman, Darrick Garner, Jacob Cowherd, Eric Niswonger, and Caleb Lucas. A special thanks to Tami Knecht with the Columbia U.S. Fish and Wildlife Service office for helping us sample on the Kansas River. Additional field assistance and data collection were provided by personnel from the Missouri Department of Conservation (MDC) Fisheries, Protection, and Outreach and Education Divisions. Additionally, the Kansas Department of Wildlife and Parks provided support when in Johnson and Wyandotte Counties. Special thanks are extended to the Chillicothe, St. Joseph, and Jefferson City MDC office Administrative Services and Human Resources staff and to Resource Science Division central office personnel for their ongoing support to this field station. Appreciation goes out to the MDC Brookfield Maintenance Center for providing expertise with equipment fabrication, repair, maintenance, and emergency repairs when needed. We extend additional thanks to staff at Blind Pony Hatchery for assistance with broodstock pallid sturgeon procurement.

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APPENDICES

Appendix A. Phylogenetic list of Kansas and Missouri River fishes with corresponding letter codes used in the long-term pallid sturgeon and associated fish community sampling program. The phylogeny follows that used by the American Fisheries Society, Common and Scientific Names of Fishes from the United States and Canada, 5th edition. Asterisks and bold type denote targeted native Missouri River species.

Scientific name	Common name	Letter Code
	CLASS CEPHALASPIDOMORPHI-LAMPREYS	
	ORDER PETROMYZONTIFORMES	
	Petromyzontidae – lampreys	
Ichthyomyzon castaneus	Chestnut lamprey	CNLP
Ichthyomyzon fossor	Northern brook lamprey	NBLP
Ichthyomyzon unicuspis	Silver lamprey	SVLP
Ichthyomyzon gagei	Southern brook lamprey	SBLR
Petromyzontidae	Unidentified lamprey	ULY
Petromyzontidae larvae	Unidentified larval lamprey	LVLP
	CLASS OSTEICHTHYES – BONY FISHES	
	ORDER ACIPENSERIFORMES	
	Ascipenseridae – sturgeons	
Acipenser fulvescens	Lake sturgeon	LKSG
Scaphirhynchus spp.	Unidentified Scaphirhynchus	USG
Scaphirhynchus albus	**Pallid sturgeon**	**PDSG***
Scaphirhynchus platorynchus	**Shovelnose sturgeon**	**SNSG***
S. albus X S. platorynchus	Pallid-shovelnose hybrid	SNPD
	Polyodontidae – paddlefishes	
Polyodon spathula	Paddlefish	PDFH
	ORDER LEPISOSTEIFORMES	
	Lepisosteidae – gars	
Lepisosteus oculatus	Spotted gar	STGR
Lepisosteus osseus	Longnose gar	LNGR
Lepisosteus platostomus	Shortnose gar	SNGR
	ORDER AMMIFORMES	
	Amiidae – bowfins	
Amia calva	Bowfin	BWFN
	ORDER OSTEOGLOSSIFORMES	
	Hiodontidae – mooneyes	
Hiodon alosoides	Goldeye	GDEY
Hiodon tergisus	Mooneye	MNEY
	ORDER ANGUILLIFORMES	
	Anguillidae – freshwater eels	
Anguilla rostrata	American eel	AMEL

Appendix A. (continued).

Scientific name	Common name	Lettter Code
	ORDER CLUPEIFORMES	
	Clupeidae – herrings	
Alosa alabame	Alabama shad	ALSD
Alosa chrysochloris	Skipjack herring	SJHR
Alosa pseudoharengus	Alewife	ALWF
Dorosoma cepedianum	Gizzard shad	GZSD
Dorosoma petenense	Threadfin shad	TFSD
D. cepedianum X D. petenense	Gizzard-threadfin shad hybrid	GSTS
	ORDER CYPRINIFORMES	
	Cyprinidae – carps and minnows	
Campostoma anomalum	Central stoneroller	CLSR
Campostoma oligolepis	Largescale stoneroller	LSSR
Carassus auratus	Goldfish	GDFH
Carassus auratus X Cyprinius carpio	Goldfish-Common carp hybrid	GFCC
Couesis plumbens	Lake chub	LKCB
Ctenopharyngodon idella	Grass carp	GSCP
Cyprinella lutrensis	Red shiner	RDSN
Cyprinella spiloptera	Spotfin shiner	SFSN
Cyprinus carpio	Common carp	CARP
Erimystax x-punctatus	Gravel chub	GVCB
Hybognathus argyritis	**Western slivery minnow**	**WSMN***
Hybognathus hankinsoni	Brassy minnow	BSMN
Hybognathus nuchalis	Mississippi silvery minnow	SVMW
Hybognathus placitus	**Plains minnow**	**PNMW***
***Hybognathus* spp.**	**Unidentified Hybognathus**	**HBNS***
Hypophthalmichthys molitrix	Silver carp	SVCP
Hypophthalmichthys nobilis	Bighead carp	BHCP
Luxilus chrysocephalus	Striped shiner	SPSN
Luxilus cornutus	Common shiner	CMSN
Luxilus zonatus	Bleeding shiner	BDSN
Lythrurus unbratilis	Western redfin shiner	WRFS
Macrhybopsis aestivalis	**Speckled chub**	**SKCB***
Macrhybopsis gelida	**Sturgeon chub**	**SGCB***
Macrhybopsis meeki	**Sicklefin chub**	**SFCB***
Macrhybopsis storeriana	Silver chub	SVCB
M. aestivalis X M. gelida	Speckled-Sturgeon chub hybrid	SPST
M. gelida X M. meeki	Sturgeon-Sicklefin chub hybrid	SCSC
Macrhybopsis spp.	Unidentified chub	UHY
Margariscus margarita	Pearl dace	PLDC
Mylocheilus caurinus	Peamouth	PEMT
Nocomis biguttatus	Hornyhead chub	HHCB
Notemigonus crysoleucas	Golden shiner	GDSN
Notropis atherinoides	Emerald shiner	ERSN
Notropis blennius	River shiner	RVSN
Notropis boops	Bigeye shiner	BESN
Notropis buchanani	Ghost shiner	GTSN
Notropis dorsalis	Bigmouth shiner	BMSN
Notropis greenei	Wedgespot shiner	WSSN

Appendix A. (continued).

Scientific name	Common name	Letter Code
	Cyprinidae – carps and minnows	
Notropis heterolepsis	Blacknose shiner	BNSN
Notropis hudsonius	Spottail shiner	STSN
Notropis nubilus	Ozark minnow	OZMW
Notropis rubellus	Rosyface shiner	RYSN
Notropis shumardi	Silverband shiner	SBSN
Notropis stilbius	Silverstripe shiner	SSPS
Notropis stramineus	**Sand shiner**	**SNSN***
Notropis topeka	Topeka shiner	TPSN
Notropis volucellus	Mimic shiner	MMSN
Notropis wickliffi	Channel shiner	CNSN
Notropis spp.	Unidentified shiner	UNO
Opsopoeodus emiliae	Pugnose minnow	PNMW
Phenacobius mirabilis	Suckermouth minnow	SMMW
Phoxinus eos	Northern redbelly dace	NRBD
Phoxinus erythrogaster	Southern redbelly dace	SRBD
Phoxinus neogaeus	Finescale dace	FSDC
Pimephales notatus	Bluntnose minnow	BNMW
Pimephales promelas	Fathead minnow	FHMW
Pimephales vigilas	Bullhead minnow	BHMW
Platygobio gracilis	Flathead chub	FHCB
P. gracilis X M. meeki	Flathead-sicklefin chub hybrid	FCSC
Rhinichthys atratulus	Blacknose dace	BNDC
Rhinichthys cataractae	Longnose dace	LNDC
Richardsonius balteatus	Redside shiner	RDSS
Scardinius erythrophtalmus	Rudd	RUDD
Semotilus atromaculatus	Creek chub	CKCB
	Unidentified Cyprinidae	UCY
	Unidentified Asian Carp	UAC
	Catostomidae - suckers	
Carpiodes carpio	River carpsucker	RVCS
Carpiodes cyprinus	Quillback	QLBK
Carpiodes velifer	Highfin carpsucker	HFCS
Carpiodes spp.	Unidentified Carpiodes	UCS
Catostomus catostomus	Longnose sucker	LNSK
Catostomus commersoni	White sucker	WTSK
Catostomus platyrhyncus	Mountain sucker	MTSK
Catastomus spp.	Unidentified *Catastomus* spp.	UCA
Cycleptus elongates	**Blue sucker**	**BUSK***
Hypentelium nigricans	Northern hog sucker	NHSK
Ictiobus bubalus	Smallmouth buffalo	SMBF
Ictiobus cyprinellus	Bigmouth buffalo	BMBF
Ictiobus niger	Black buffalo	BKBF
Ictiobus spp.	Unidentified buffalo	UBF
Minytrema melanops	Spotted sucker	SPSK
Moxostoma anisurum	Silver redhorse	SVRH
Moxostoma carinatum	River redhorse	RVRH
Moxostoma duquesnei	Black redhorse	BKRH
Moxostoma erythrurum	Golden redhorse	GDRH
Moxostoma macrolepidotum	Shorthead redhorse	SHRH
Moxostoma spp.	Unidentified redhorse	URH

Appendix A. (continued).

Scientific name	Common name	Letter Code
Catostomidae - suckers	Unidentified Catostomidae	UCT
	ORDER SILURIFORMES	
	Ictaluridae – bullhead catfishes	
Ameiurus melas	Black bullhead	BKBH
Ameiurus natalis	Yellow bullhead	YLBH
Ameiurusnebulosus	Brown bullhead	BRBH
Ameiurus spp.	Unidentified bullhead	UBH
Ictalurus furcatus	Blue catfish	BLCF
Ictalurus punctatus	Channel catfish	CNCF
I. furcatus X I. punctatus	Blue-channel catfish hybrid	BCCC
Ictalurus spp.	Unidentified *Ictalurus* spp.	UCF
Noturus exilis	Slender madtom	SDMT
Noturus flavus	Stonecat	STCT
Noturus gyrinus	Tadpole madtom	TPMT
Noturus nocturnes	Freckled madtom	FKMT
Pylodictis olivaris	Flathead catfish	FHCF
	ORDER SALMONIFORMES	
	Esocidae - pikes	
Esox americanus vermiculatus	Grass pickerel	GSPK
Esox lucius	Northern pike	NTPK
Esox masquinongy	Muskellunge	MSKG
E. lucius X E. masquinongy	Tiger Muskellunge	TGMG
	Umbridae - mudminnows	
Umbra limi	Central mudminnow	MDMN
	Osmeridae - smelts	
Osmerus mordax	Rainbow smelt	RBST
	Salmonidae - trouts	
Coregonus artedi	Lake herring or cisco	CSCO
Coregonus clupeaformis	Lake whitefish	LKWF
Oncorhynchus aguabonita	Golden trout	GDTT
Oncorhynchus clarki	Cutthroat trout	CTTT
Oncorhynchus kisutch	Coho salmon	CHSM
Oncorhynchus mykiss	Rainbow trout	RBTT
Oncorhynchus nerka	Sockeye salmon	SESM
Oncorhynchus tshawytscha	Chinook salmon	CNSM
Prosopium cylindraceum	Bonniville cisco	BVSC
Prosopium williamsoni	Mountain whitefish	MTWF
Salmo trutta	Brown trout	BNTT
Salvelinus fontinalis	Brook trout	BKTT
Salvelinus namaycush	Lake trout	LKTT
Thymallus arcticus	Arctic grayling	AMGL

Appendix A. (continued).

Scientific name	Common name	Letter Code
	ORDER PERCOPSIFORMES	
	Percopsidae – trout-perches	
Percopsis omiscomaycus	Trout-perch	TTPH
	ORDER GADIFORMES	
	Gadidae - cods	
Lota lota	Burbot	BRBT
	ORDER ATHERINIFORMES	
	Cyprinodontidae - killifishes	
Fundulus catenatus	Northern studfish	NTSF
Fundulus daphanus	Banded killifish	BDKF
Fundulus notatus	Blackstripe topminnow	BSTM
Fundulus olivaceus	Blackspotted topminnow	BPTM
Fundulus sciadicus	Plains topminnow	PTMW
Fundulus zebrinus	Plains killifish	PKLF
	Poeciliidae - livebearers	
Gambusia affinis	Western mosquitofish	MQTF
	Atherinidae - silversides	
Labidesthes sicculus	Brook silverside	BKSS
	ORDER GASTEROSTEIFORMES	
	Gasterosteidae - sticklebacks	
Culea inconstans	Brook stickleback	BKSB
	ORDER SCORPAENIFORMES	
	Cottidae - sculpins	
Cottus bairdi	Mottled sculpin	MDSP
Cottus carolinae	Banded sculpin	BDSP
	ORDER PERCIFORMES	
	Percichthyidae – temperate basses	
Morone Americana	White perch	WTPH
Morone chrysops	White bass	WTBS
Morone mississippiensis	Yellow bass	YWBS
Morone saxatilis	Striped bass	SDBS
M. saxatilis X M. chrysops	Striped-white bass hybrid	SBWB
	Centrarchidae - sunfishes	
Ambloplites rupestris	Rock bass	RKBS
Archoplites interruptus	Sacremento perch	SOPH
Lepomis cyanellus	Green sunfish	GNSF
Lepomis gibbosus	Pumpkinseed	PNSD
Lepomis gulosus	Warmouth	WRMH
Lepomis humilis	Orangespotted sunfish	OSSF
Lepomis macrochirus	Bluegill	BLGL
Lepomis magalotis	Longear sunfish	LESF
Lepomis microlophus	Redear sunfish	RESF
L. cyanellus X L. macrochirus	Green sunfish-bluegill hybrid	GSBG

Appendix A. (continued).

Scientific name	Common name	Letter Code
	Centrarchidae - sunfishes	
L. cyanellus X L. humilis	Green-orangespotted sunfish hybrid	GSOS
L. macrochirus X L. microlophus	Bluegill-redear sunfish hybrid	BGRE
Lepomis spp.	Unidentified *Lepomis*	ULP
Micropterus dolomieu	Smallmouth bass	SMBS
Micropterus punctatus	Spotted sunfish	STBS
Micropterus salmoides	Largemouth bass	LMBS
Micropterus spp.	Unidentified *Micropterus* spp.	UMC
Pomoxis annularis	White crappie	WTCP
Pomoxis nigromaculatus	Black crappie	BKCP
Pomoxis spp.	Unidentified crappie	UCP
P. annularis X P. nigromaculatus	White-black crappie hybrid	WCBC
Centrarchidae	Unidentified centrarchid	UCN
	Percidae - perches	
Ammocrypta asprella	Crystal darter	CLDR
Etheostoma blennioides	Greenside darter	GSDR
Etheostoma caeruleum	Rainbow darter	RBDR
Etheostoma exile	Iowa darter	IODR
Etheostoma flabellare	Fantail darter	FTDR
Etheostoma gracile	Slough darter	SLDR
Etheostoma microperca	Least darter	LTDR
Etheostoma nigrum	Johnny darter	JYDR
Etheostoma punctulatum	Stippled darter	STPD
Etheostoma spectabile	Orangethroated darter	OTDR
Etheostoma tetrazonum	Missouri saddled darter	MSDR
Etheostoma zonale	Banded darter	BDDR
Etheostoma spp.	Unidentified Etheostoma spp.	UET
Perca flavescens	Yellow perch	YWPH
Percina caproides	Logperch	LGPH
Percina cymatotaenia	Bluestripe darter	BTDR
Percina evides	Gilt darter	GLDR
Percina maculate	Blackside darter	BSDR
Percina phoxocephala	Slenderhead darter	SHDR
Percina shumardi	River darter	RRDR
Percina spp.	Unidentified Percina spp.	UPN
	Unidentified darter	UDR
Sander canadense	**Sauger**	**SGER***
Sander vitreus	Walleye	WLEY
S. canadense X S. vitreus	Sauger-walley hybrid/Saugeye	SGWE
Sander spp.	Unidentified *Sander* (formerly *Stizostedion*) spp.	UST
	Unidentified Percidae	UPC
	Sciaenidae - drums	
Aplodinotus grunniens	Freshwater drum	FWDM
	NON-TAXONOMIC CATEGORIES	
	Age-0/Young-of-year fish	YOYF
	Lab fish for identification	LAB
	No fish caught	NFSH
	Unidentified larval fish	LVFS
	Unidentified	UNID
	Net Malfunction (Did Not Fish)	NDNF

Appendix B. Definitions and codes used to classify standard Kansas and Missouri River habitats in the long-term pallid sturgeon and associated fish community sampling program. Three habitat scales were used in the hierarchical habitat classification system: Macrohabitats, Mesohabitats, and Microhabitats.

Habitat	Scale	Definition	Code
Braided channel	Macro	An area of the river that contains multiple smaller channels and is lacking a readily identifiable main channel (typically associated with unchannelized sections)	BRAD
Main channel cross over	Macro	The inflection point of the thalweg where the thalweg crosses from one concave side of the river to the other concave side of the river, (i.e., transition zone from one-bend to the next bend). The upstream CHXO for a respective bend is the one sampled.	CHXO
Tributary confluence	Macro	Area immediately downstream, extending up to one bend in length, from a junction of a large tributary and the main river where this tributary has influence on the physical features of the main river	CONF
Dendric	Macro	An area of the river where the river transitions from meandering or braided channel to more of a treelike pattern with multiple channels (typically associated with unchannelized sections)	DEND
Deranged	Macro	An area of the river where the river transitions from a series of multiple channels into a meandering or braided channel (typically associated with unchannelized sections)	DRNG
Main channel inside bend	Macro	The convex side of a river bend	ISB
Main channel outside bend	Macro	The concave side of a river bend	OSB
Secondary channel-connected large	Macro	A side channel, open on upstream and downstream ends, with less flow than the main channel, large indicates this habitat can be sampled with trammel nets and trawls based on width and/or depths > 1.2 m	SCCL
Secondary channel-connected small	Macro	A side channel, open on upstream and downstream ends, with less flow than the main channel, small indicates this habitat cannot be sampled with trammel nets and trawls based on width and/or on depths < 1.2 m	SCCS
Secondary channel-non-connected	Macro	A side channel that is blocked at one end	SCCN
Tributary	Macro	Any river or stream flowing in the Missouri River	TRIB
Tributary large mouth	Macro	Mouth of entering tributary whose mean annual discharge is > 20 m^3/s, and the sample area extends 300 m into the tributary	TRML
Tributary small mouth	Macro	Mouth of entering tributary whose mean annual discharge is < 20 m^3/s, mouth width is > 6 m wide and the sample area extends 300 m into the tributary	TRMS
Wild	Macro	All habitats not covered in the previous habitat descriptions	WILD
Bars	Meso	Sandbar or shallow bank-line areas with depth < 1.2 m	BARS
Pools	Meso	Areas immediately downstream from sandbars, dikes, snags, or other obstructions with a formed scour hole > 1.2 m	POOL
Channel border	Meso	Area in the channelized river between the toe and the thalweg, area in the unchannelized river between the toe and the maximum depth	CHNB
Dam Tailwaters	Meso	Area below dam	DTWT
Thalweg	Meso	Main channel between the channel borders conveying the majority of the flow	TLWG
Island tip	Meso	Area immediately downstream of a bar or island where two channels converge with water depths > 1.2 m	ITIP

Appendix C. List of standard and wild gears (type), their corresponding codes in the database, seasons deployed (Fall-Spring, Summer, or all), years used, and catch-per-unit-effort units for collection of Kansas River fishes in segment 11 for the long-term pallid sturgeon and associated fish community sampling program. Long-term monitoring began in 2006 for segment 11.

Gear	Code	Type	Season	Years	CPUE units
Gillnet – 4 meshes, small mesh set upstream	GN14	Standard	Sturgeon	2003 - Present	fish/net night
Gillnet – 4 meshes, large mesh set upstream	GN41	Standard	Sturgeon	2003 - Present	fish/net night
Gillnet – 8 meshes, small mesh set upstream	GN18	Standard	Sturgeon	2003 - Present	fish/net night
Gillnet – 8 meshes, large mesh set upstream	GN81	Standard	Sturgeon	2003 - Present	fish/net night
Mini-fyke net	MF	Standard	Fish Comm.	2003 - Present	fish/net night
Push Trawl – 8 ft 4mm x 4mm	POT02	Evaluation	Fish Comm.	2006 - Present	fish/ m trawled
Trammel net – 1 inch inner mesh	TN	Standard	All	2003 - Present	fish/100 m drift
Trot Line – Circle hooks**	TLC_	Wild	Sturgeon	2007 - Present	fish/hook night
Trot Line – Octopus hooks**	TLO_	Wild	Sturgeon	2007 - Present	fish/hook night
Trot Line – O'Shaughnessy hooks**	TLS_	Wild	Sturgeon	2007 - Present	fish/hook night
Otter trawl – 16 ft head rope	OT16	Standard	All	2003 - Present	fish/100 m trawled
Otter trawl – 16 ft SKT 4mm x 4mm HB2 MOR	OT01	Wild	Fish Comm.	2006 - Present	fish/100 m trawled

* Standard only in upper Missouri River segments

** Code ends with line length in feet (1 = 105 ft, 2 = 205 ft, 3 = 305 ft, 4 = 405 ft). Hooks are placed between 5 and 10 feet apart.

Appendix D. Stocking locations and codes by Recovery Priority Management Area (RPMA) in the Missouri River Basin.

State(s)	RPMA	Site Name	Code	River	RM
MT	2	Above Intake	AIN	Yellowstone	70 +
MT	2	Intake	INT	Yellowstone	70.0
MT	2	Sidney	SID	Yellowstone	31.0
MT	2	Big Sky Bend	BSB	Yellowstone	17.0
ND	2	Fairview	FRV	Yellowstone	9.0
MT	2	Milk River	MLK	Milk	11.5
MT	2	Mouth of Milk	MOM	Missouri	1761.5
MT	2	Wolf Point	WFP	Missouri	1701.5
MT	2	Poplar	POP	Missouri	1649.5
MT	2	Brockton	BRK	Missouri	1678.0
MT	2	Culbertson	CBS	Missouri	1621.0
MT	2	Nohly Bridge	NOB	Missouri	1590.0
ND	2	Confluence	CON	Missouri	1581.5
SD/NE	3	Sunshine Bottom	SUN	Missouri	866.2
SD/NE	3	Verdel Boat Ramp	VER	Missouri	855.0
SD/NE	3	Standing Bear Bridge	STB	Missouri	845.0
SD/NE	3	Running Water	RNW	Missouri	840.1
SD/NE	4	St. Helena	STH	Missouri	799.0
SD/NE	4	Mullberry Bend	MUL	Missouri	775.0
NE/IA	4	Ponca State Park	PSP	Missouri	753.0
NE/IA	4	Sioux City	SIO	Missouri	732.6
NE/IA	4	Decatur	DCT	Missouri	691.0
NE/IA	4	Boyer Chute	BYC	Missouri	637.4
NE/IA	4	Bellevue	BEL	Missouri	601.4
NE/IA	4	Rulo	RLO	Missouri	497.9
NE/MO/KS	4	Kansas River	KSR	Missouri	367.5
NE	4	Platte River	PLR	Platte	5.0
KA/MO	4	Leavenworth	LVW	Missouri	397.0
MO	4	Parkville	PKV	Missouri	377.5
MO	4	Kansas City	KAC	Missouri	342.0
MO	4	Miami	MIA	Missouri	262.8
MO	4	Grand River	GDR	Missouri	250.0
MO	4	Boonville	BOO	Missouri	195.1
MO	4	Overton	OVT	Missouri	185.1
MO	4	Hartsburg	HAR	Missouri	160.0
MO	4	Jefferson City	JEF	Missouri	143.9
MO	4	Mokane	MOK	Missouri	124.7
MO	4	Hermann	HER	Missouri	97.6
MO	4	Washington	WAS	Missouri	68.5
MO	4	St. Charles	STC	Missouri	28.5

Appendix E. Juvenile and adult pallid sturgeon stocking summary for segment 11 of the Missouri River (RPMA 4)**

Year	Stocking Site	Number Stocked	Year Class	Stock Date	Age at Stocking[a]	Primary Mark	Secondary Mark
2006	Parkville	174	2005	6/21/2006	Yearling	PIT Tag	Elasomer
2006	Parkville	402	2005	7/1/2006	Yearling	PIT Tag	Elasomer

[a]Age of fish when stocked: Fry, Fingerling, Yearling, 1yo, 2yo, 3yo, etc…

**There have been no pallid sturgeon stocked into segment 11; the closest stocking site Parkville, MO, located 10 river miles from the mouth of the Kansas River.

Appendix F

Total catch, overall mean catch per unit effort [± 2 SE], and mean CPUE (fish/100 m) by Mesohabitat within a Macrohabitat for all species caught with each gear type during sturgeon season and fish community season for segment 11, the Kansas River, during 2006-2007. Species captured are listed alphabetically and their codes are presented in Appendix A. Asterisks with bold type indicate targeted native Missouri River species and habitat abbreviations are presented in Appendix B. Standard Error was not calculated when N < 2.

Appendix F1. Gill Net: overall season and segment summary. Lists CPUE (fish/net night) and 2 standard errors on second line.

Species	Total Catch	Overall CPUE	CHXO		ISB	OSB		SCCL	
			CHNB	POOL	CHNB	CHNB	POOL	CHNB	ITIP
BHCP	1	0.016	0	0	0	0	0	0.5	0
		0.031	0		0	0	0		
BHMW	0	0	0	0	0	0	0	0	0
		0	0		0	0	0		
BKCP	0	0	0	0	0	0	0	0	0
		0	0		0	0	0		
BLCF	8	0.125	0.4	0	0.062	0.071	0.25	0	0
		0.078	0.2		0.125	0.097	0.5		
BLGL	0	0	0	0	0	0	0	0	0
		0	0		0	0	0		
BMBF	1	0.016	0	0	0.062	0	0	0	0
		0.031	0		0.125	0	0		
BNMW	0	0	0	0	0	0	0	0	0
		0	0		0	0	0		
BUSK*	**21**	**0.375**	**0.3**	**2**	**0**	**0.321**	**0**	**2.5**	**1.5**
		0.242	**0.4**		**0**	**0.289**	**0**		
CARP	7	0.125	0.1	0	0	0.179	0	0.5	0.5
		0.1	0.2		0	0.199	0		
CNCF	6	0.094	0.1	0	0	0.107	0.25	0	0.5
		0.083	0.2		0	0.155	0.5		
ERSN	0	0	0	0	0	0	0	0	0
		0	0		0	0	0		
FHCF	2	0.031	0	0	0	0.071	0	0	0
		0.043	0		0	0.097	0		
FHMW	0	0	0	0	0	0	0	0	0
		0	0		0	0	0		
FWDM	5	0.078	0	0	0	0.107	0.5	0	0
		0.065	0		0	0.114	0		
GDEY	21	0.328	0.4	0	0	0.25	2.5	0	0
		0.344	0.583		0	0.31	5		
GDSN	0	0	0	0	0	0	0	0	0
		0	0		0	0	0		
GNSF	0	0	0	0	0	0	0	0	0
		0	0		0	0	0		

Species	Total Catch	Overall CPUE	CHXO		ISB	OSB		SCCL	
			CHNB	POOL	CHNB	CHNB	POOL	CHNB	ITIP
GSCP	1	0.016	0.1	0	0	0	0	0	0
		0.031	0.2		0	0	0		
GZSD	10	0.156	0.1	0	0.062	0.286	0	0	0
		0.145	0.2		0.125	0.309	0		
HBNS*	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
		0	**0**		**0**	**0**	**0**		
LESF	0	0	0	0	0	0	0	0	0
		0	0		0	0	0		
LMBS	0	0	0	0	0	0	0	0	0
		0	0		0	0	0		
LNGR	12	0.188	0.2	0	0.125	0.036	0	0	3.5
		0.228	0.4		0.164	0.071	0		
MQTF	0	0	0	0	0	0	0	0	0
		0	0		0	0	0		
OSSF	0	0	0	0	0	0	0	0	0
		0	0		0	0	0		
PDSG*	**1**	**0.016**	**0.1**	**0**	**0**	**0**	**0**	**0**	**0**
		0.031	**0.2**		**0**	**0**	**0**		
PNMW*	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
		0	**0**		**0**	**0**	**0**		
QLBK	0	0	0	0	0	0	0	0	0
		0	0		0	0	0		
RDSN	0	0	0	0	0	0	0	0	0
		0	0		0	0	0		
RVCS	4	0.062	0.1	0	0.062	0.036	0	0	0.5
		0.059	0.2		0.125	0.071	0		
RVSN	0	0	0	0	0	0	0	0	0
		0	0		0	0	0		
SGER*	**1**	**0.016**	**0**	**0**	**0**	**0.036**	**0**	**0**	**0**
		0.031	**0**		**0**	**0.071**	**0**		
SHDR	0	0	0	0	0	0	0	0	0
		0	0		0	0	0		
SHRH	0	0	0	0	0	0	0	0	0
		0	0		0	0	0		
SKCB*	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
		0	**0**		**0**	**0**	**0**		

Species	Total Catch	Overall CPUE	CHXO		ISB	OSB		SCCL	
			CHNB	POOL	CHNB	CHNB	POOL	CHNB	ITIP
SMBF	26	0.453	0.5	0	0.375	0.429	0.75	0.5	1
		0.235	0.447		0.62	0.345	1.5		
SMMW	0	0	0	0	0	0	0	0	0
		0	0		0	0	0		
SNGR	0	0	0	0	0	0	0	0	0
		0	0		0	0	0		
SNPD	2	0.031	0.1	0	0	0.036	0	0	0
		0.043	0.2		0	0.071	0		
SNSG*	**379**	**6.531**	**7**	**29**	**0.875**	**6.643**	**5.25**	**17.5**	**17**
		3.651	**9.849**		**1.098**	**6.226**	**9.5**		
SNSN*	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
		0	**0**		**0**	**0**	**0**		
STCT	0	0	0	0	0	0	0	0	0
		0	0		0	0	0		
SVCB	0	0	0	0	0	0	0	0	0
		0	0		0	0	0		
SVCP	2	0.047	0.2	0	0	0	0.25	0	0
		0.069	0.4		0	0	0.5		
UCY	0	0	0	0	0	0	0	0	0
		0	0		0	0	0		
UDR	0	0	0	0	0	0	0	0	0
		0	0		0	0	0		
UHY	0	0	0	0	0	0	0	0	0
		0	0		0	0	0		
UIC	0	0	0	0	0	0	0	0	0
		0	0		0	0	0		
WTBS	2	0.031	0	0	0	0.036	0	0	0.5
		0.043	0		0	0.071	0		
WTCP	5	0.078	0	0	0	0.143	0.25	0	0
		0.128	0		0	0.286	0.5		
YLBH	0	0	0	0	0	0	0	0	0
		0	0		0	0	0		
YOYF	0	0	0	0	0	0	0	0	0
		0	0		0	0	0		

Appendix F2. 1 Inch Trammel Net: overall season and segment summary. Lists CPUE (fish/100 m) and 2 standard errors on second line.

Species	Total Catch	Overall CPUE	CHXO		ISB	OSB	SCCL
			CHNB	ITIP	CHNB	CHNB	ITIP
BHCP	1	0.014	0	0	0	0	0.333
		0.029	0	0	0	0	0.667
BHMW	0	0	0	0	0	0	0
		0	0	0	0	0	0
BKCP	0	0	0	0	0	0	0
		0	0	0	0	0	0
BLCF	3	0.039	0	0	0.063	0	0
		0.047	0	0	0.075	0	0
BLGL	0	0	0	0	0	0	0
		0	0	0	0	0	0
BMBF	1	0.014	0	0	0.022	0	0
		0.028	0	0	0.044	0	0
BNMW	0	0	0	0	0	0	0
		0	0	0	0	0	0
BUSK*	**4**	**0.047**	**0.133**	**0**	**0.018**	**0.115**	**0**
		0.055	**0.267**	**0**	**0.037**	**0.23**	**0**
CARP	0	0	0	0	0	0	0
		0	0	0	0	0	0
CNCF	6	0.093	0.067	0	0.079	0.133	0.333
		0.075	0.133	0	0.091	0.267	0.667
ERSN	0	0	0	0	0	0	0
		0	0	0	0	0	0
FHCF	2	0.025	0.056	0	0.027	0	0
		0.037	0.111	0	0.053	0	0
FHMW	0	0	0	0	0	0	0
		0	0	0	0	0	0
FWDM	0	0	0	0	0	0	0
		0	0	0	0	0	0
GDEY	5	0.085	0.114	0	0.11	0	0
		0.11	0.227	0	0.169	0	0
GDSN	0	0	0	0	0	0	0
		0	0	0	0	0	0
GNSF	0	0	0	0	0	0	0
		0	0	0	0	0	0

Species	Total Catch	Overall CPUE	CHXO		ISB	OSB	SCCL
			CHNB	ITIP	CHNB	CHNB	ITIP
GSCP	1	0.013	0	0	0.021	0	0
		0.026	0	0	0.042	0	0
GZSD	3	0.039	0.097	0	0.041	0	0
		0.045	0.194	0	0.057	0	0
HBNS*	**0**	**0**	**0**	**0**	**0**	**0**	**0**
		0	**0**	**0**	**0**	**0**	**0**
LESF	0	0	0	0	0	0	0
		0	0	0	0	0	0
LMBS	0	0	0	0	0	0	0
		0	0	0	0	0	0
LNGR	5	0.076	0	0.333	0.072	0.115	0
		0.077	0	0.667	0.103	0.23	0
MQTF	0	0	0	0	0	0	0
		0	0	0	0	0	0
OSSF	0	0	0	0	0	0	0
		0	0	0	0	0	0
PDSG*	**0**	**0**	**0**	**0**	**0**	**0**	**0**
		0	**0**	**0**	**0**	**0**	**0**
PNMW*	**0**	**0**	**0**	**0**	**0**	**0**	**0**
		0	**0**	**0**	**0**	**0**	**0**
QLBK	0	0	0	0	0	0	0
		0	0	0	0	0	0
RDSN	0	0	0	0	0	0	0
		0	0	0	0	0	0
RVCS	8	0.136	0.064	0	0.204	0	0
		0.164	0.127	0	0.26	0	0
RVSN	0	0	0	0	0	0	0
		0	0	0	0	0	0
SGER*	**2**	**0.026**	**0.064**	**0**	**0.027**	**0**	**0**
		0.038	**0.127**	**0**	**0.053**	**0**	**0**
SHDR	0	0	0	0	0	0	0
		0	0	0	0	0	0
SHRH	1	0.016	0	0	0.025	0	0
		0.032	0	0	0.051	0	0
SKCB*	**0**	**0**	**0**	**0**	**0**	**0**	**0**
		0	**0**	**0**	**0**	**0**	**0**

Species	Total Catch	Overall CPUE	CHXO		ISB	OSB	SCCL
			CHNB	ITIP	CHNB	CHNB	ITIP
SMBF	13	0.188	0.133	0	0.186	0.364	0
		0.136	0.267	0	0.174	0.52	0
SMMW	0	0	0	0	0	0	0
		0	0	0	0	0	0
SNGR	1	0.017	0	0	0.027	0	0
		0.034	0	0	0.054	0	0
SNPD	0	0	0	0	0	0	0
		0	0	0	0	0	0
SNSG*	**118**	**1.694**	**0.507**	**0.763**	**1.933**	**2.539**	**0.333**
		0.719	**0.596**	**0.782**	**0.828**	**3.364**	**0.667**
SNSN*	**0**	**0**	**0**	**0**	**0**	**0**	**0**
		0	**0**	**0**	**0**	**0**	**0**
STCT	0	0	0	0	0	0	0
		0	0	0	0	0	0
SVCB	0	0	0	0	0	0	0
		0	0	0	0	0	0
SVCP	3	0.044	0	0	0.047	0	0.333
		0.05	0	0	0.067	0	0.667
UCY	0	0	0	0	0	0	0
		0	0	0	0	0	0
UDR	0	0	0	0	0	0	0
		0	0	0	0	0	0
UHY	0	0	0	0	0	0	0
		0	0	0	0	0	0
UIC	0	0	0	0	0	0	0
		0	0	0	0	0	0
WTBS	0	0	0	0	0	0	0
		0	0	0	0	0	0
WTCP	0	0	0	0	0	0	0
		0	0	0	0	0	0
YLBH	0	0	0	0	0	0	0
		0	0	0	0	0	0
YOYF	0	0	0	0	0	0	0
		0	0	0	0	0	0

Appendix F4. Otter Trawl: overall season and segment summary. Lists CPUE (fish/100 m) and 2 standard errors on second line.

Species	Total Catch	Overall CPUE	CHXO		ISB	OSB	SCCL	
			CHNB	ITIP	CHNB	CHNB	CHNB	ITIP
BHCP	0	0	0	0	0	0	0	0
		0	0	0	0	0		0
BHMW	11	0.145	0	0	0.246	0.103	0	0
		0.128	0	0	0.255	0.148		0
BKCP	0	0	0	0	0	0	0	0
		0	0	0	0	0		0
BLCF	159	2.147	0.764	11.583	1.869	2.159	0.826	0.641
		1.277	1.125	18.42	1.747	1.752		1.282
BLGL	1	0.009	0	0	0	0.031	0	0
		0.018	0	0	0	0.063		0
BMBF	0	0	0	0	0	0	0	0
		0	0	0	0	0		0
BNMW	0	0	0	0	0	0	0	0
		0	0	0	0	0		0
BUSK*	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
		0	**0**	**0**	**0**	**0**		**0**
CARP	1	0.013	0	0	0	0.046	0	0
		0.026	0	0	0	0.092		0
CNCF	265	3.384	1.659	4.042	2.683	6.001	0	0.513
		2.344	0.915	4.691	1.558	7.94		1.026
ERSN	30	0.413	1.354	0	0.036	0.375	4.959	0.427
		0.387	2.238	0	0.054	0.504		0.855
FHCF	13	0.246	0.103	0.444	0.122	0.552	0	0
		0.234	0.206	0.889	0.127	0.788		0
FHMW	0	0	0	0	0	0	0	0
		0	0	0	0	0		0
FWDM	34	0.637	0	6.903	0.218	0.737	1.653	0
		0.587	0	11.854	0.216	0.689		0
GDEY	0	0	0	0	0	0	0	0
		0	0	0	0	0		0
GDSN	0	0	0	0	0	0	0	0
		0	0	0	0	0		0
GNSF	0	0	0	0	0	0	0	0
		0	0	0	0	0		0

Species	Total Catch	Overall CPUE	CHXO		ISB	OSB	SCCL	
			CHNB	ITIP	CHNB	CHNB	CHNB	ITIP
GSCP	0	0	0	0	0	0	0	0
		0	0	0	0	0		0
GZSD	3	0.043	0	0	0.065	0	0.826	0
		0.05	0	0	0.092	0		0
HBNS*	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
		0	**0**	**0**	**0**	**0**		**0**
LESF	0	0	0	0	0	0	0	0
		0	0	0	0	0		0
LMBS	0	0	0	0	0	0	0	0
		0	0	0	0	0		0
LNGR	0	0	0	0	0	0	0	0
		0	0	0	0	0		0
MQTF	0	0	0	0	0	0	0	0
		0	0	0	0	0		0
OSSF	0	0	0	0	0	0	0	0
		0	0	0	0	0		0
PDSG*	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
		0	**0**	**0**	**0**	**0**		**0**
PNMW*	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
		0	**0**	**0**	**0**	**0**		**0**
QLBK	1	0.015	0.103	0	0	0	0	0
		0.03	0.206	0	0	0		0
RDSN	3	0.036	0.114	0.208	0.021	0	0	0
		0.042	0.227	0.417	0.042	0		0
RVCS	3	0.049	0	0	0.105	0	0	0
		0.061	0	0	0.129	0		0
RVSN	0	0	0	0	0	0	0	0
		0	0	0	0	0		0
SGER*	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
		0	**0**	**0**	**0**	**0**		**0**
SHDR	1	0.008	0	0	0.017	0	0	0
		0.016	0	0	0.035	0		0
SHRH	1	0.016	0.106	0	0	0	0	0
		0.031	0.213	0	0	0		0
SKCB*	**7**	**0.076**	**0**	**0.208**	**0.107**	**0.018**	**0**	**0.256**
		0.059	**0**	**0.417**	**0.108**	**0.035**		**0.513**

Species	Total Catch	Overall CPUE	CHXO		ISB	OSB	SCCL	
			CHNB	ITIP	CHNB	CHNB	CHNB	ITIP
SMBF	2	0.015	0	0	0.022	0.018	0	0
		0.023	0	0	0.045	0.035		0
SMMW	0	0	0	0	0	0	0	0
		0	0	0	0	0		0
SNGR	0	0	0	0	0	0	0	0
		0	0	0	0	0		0
SNPD	0	0	0	0	0	0	0	0
		0	0	0	0	0		0
SNSG*	**33**	**0.384**	**0.841**	**0.417**	**0.312**	**0.338**	**0**	**0**
		0.205	**0.931**	**0.833**	**0.25**	**0.326**		**0**
SNSN*	**6**	**0.068**	**0.222**	**0.208**	**0**	**0.049**	**0.826**	**0**
		0.057	**0.263**	**0.417**	**0**	**0.097**		**0**
STCT	1	0.014	0	0	0	0.049	0	0
		0.027	0	0	0	0.097		0
SVCB	35	0.362	0.513	0	0.292	0.176	0	2.256
		0.219	0.615	0	0.201	0.167		3.77
SVCP	0	0	0	0	0	0	0	0
		0	0	0	0	0		0
UCY	0	0	0	0	0	0	0	0
		0	0	0	0	0		0
UDR	0	0	0	0	0	0	0	0
		0	0	0	0	0		0
UHY	1	0.031	0	0.694	0	0	0	0
		0.061	0	1.389	0	0		0
UIC	0	0	0	0	0	0	0	0
		0	0	0	0	0		0
WTBS	0	0	0	0	0	0	0	0
		0	0	0	0	0		0
WTCP	0	0	0	0	0	0	0	0
		0	0	0	0	0		0
YLBH	0	0	0	0	0	0	0	0
		0	0	0	0	0		0
YOYF	0	0	0	0	0	0	0	0
		0	0	0	0	0		0

Appendix F6. Mini-fyke Net: overall season and segment summary. Lists CPUE (fish/net night) and 2 standard errors on second line.

Species	Total Catch	Overall CPUE	CHXO BAR	ISB BAR	OSB BAR
BHCP	0	0	0	0	0
		0	0	0	0
BHMW	132	5.5	2.833	4.091	10
		3.598	3.879	3.056	10.735
BKCP	2	0.083	0	0.182	0
		0.115	0	0.244	0
BLCF	1	0.042	0	0	0.143
		0.083	0	0	0.286
BLGL	38	1.583	0.667	1.818	2
		0.798	0.843	1.397	1.447
BMBF	0	0	0	0	0
		0	0	0	0
BNMW	2	0.083	0	0.182	0
		0.167	0	0.364	0
BUSK*	**0**	**0**	**0**	**0**	**0**
		0	**0**	**0**	**0**
CARP	5	0.208	0.167	0	0.571
		0.24	0.333	0	0.738
CNCF	19	0.792	0.5	0.636	1.286
		0.551	0.683	0.776	1.36
ERSN	62	2.583	2.167	4.364	0.143
		3.021	3.159	6.343	0.286
FHCF	0	0	0	0	0
		0	0	0	0
FHMW	3	0.125	0	0	0.429
		0.25	0	0	0.857
FWDM	13	0.542	0.667	0.364	0.714
		0.361	0.667	0.488	0.841
GDEY	0	0	0	0	0
		0	0	0	0
GDSN	1	0.042	0	0	0.143
		0.083	0	0	0.286
GNSF	56	2.333	3.833	3	0
		1.714	4.991	2.427	0

Species	Total Catch	Overall CPUE	CHXO BAR	ISB BAR	OSB BAR
GSCP	0	0	0	0	0
		0	0	0	0
GZSD	217	9.042	3.5	16.364	2.286
		13.257	3.215	28.93	2.534
HBNS*	**1**	**0.042**	**0.167**	**0**	**0**
		0.083	**0.333**	**0**	**0**
LESF	1	0.042	0	0.091	0
		0.083	0	0.182	0
LMBS	26	1.083	0.333	1.091	1.714
		0.916	0.667	1.606	1.837
LNGR	1	0.042	0	0	0.143
		0.083	0	0	0.286
MQTF	32	1.333	1.667	0.545	2.286
		0.84	2.231	0.909	1.494
OSSF	10	0.417	0	0.182	1.143
		0.601	0	0.364	1.973
PDSG*	**0**	**0**	**0**	**0**	**0**
		0	**0**	**0**	**0**
PNMW*	**3**	**0.125**	**0.333**	**0.091**	**0**
		0.138	**0.422**	**0.182**	**0**
QLBK	0	0	0	0	0
		0	0	0	0
RDSN	911	37.958	42.333	18.273	65.143
		19.366	25.637	11.743	56.472
RVCS	159	6.625	4.333	10.364	2.714
		3.162	2.86	6.026	1.616
RVSN	11	0.458	0	1	0
		0.481	0	0.972	0
SGER*	**0**	**0**	**0**	**0**	**0**
		0	**0**	**0**	**0**
SHDR	0	0	0	0	0
		0	0	0	0
SHRH	0	0	0	0	0
		0	0	0	0
SKCB*	**0**	**0**	**0**	**0**	**0**
		0	**0**	**0**	**0**

Species	Total Catch	Overall CPUE	CHXO BAR	ISB BAR	OSB BAR
SMBF	0	0	0	0	0
		0	0	0	0
SMMW	3	0.125	0	0.273	0
		0.183	0	0.39	0
SNGR	14	0.583	0.667	0.636	0.429
		0.495	1.333	0.776	0.595
SNPD	0	0	0	0	0
		0	0	0	0
SNSG*	**0**	**0**	**0**	**0**	**0**
		0	**0**	**0**	**0**
SNSN*	**185**	**7.708**	**10.667**	**6.818**	**6.571**
		4.136	**9.739**	**6.272**	**6.885**
STCT	2	0.083	0	0	0.286
		0.115	0	0	0.369
SVCB	9	0.375	1.167	0.182	0
		0.447	1.667	0.244	0
SVCP	0	0	0	0	0
		0	0	0	0
UCY	0	0	0	0	0
		0	0	0	0
UDR	0	0	0	0	0
		0	0	0	0
UHY	0	0	0	0	0
		0	0	0	0
UIC	2	0.083	0	0.091	0.143
		0.115	0	0.182	0.286
WTBS	8	0.333	0.667	0.182	0.286
		0.374	1.333	0.364	0.369
WTCP	16	0.667	0	1.182	0.429
		1.005	0	2.171	0.595
YLBH	1	0.042	0.167	0	0
		0.083	0.333	0	0
YOYF	1	0.042	0	0	0.143
		0.083	0	0	0.286

Appendix F7. Push Trawl: overall season and segment summary. Lists CPUE (fish/net night) and 2 standard errors on second line.

Species	Total Catch	Overall CPUE	CHXO BAR	ISB BAR	OSB BAR
BHCP	0	0	0	0	0
		0	0	0	0
BHMW	612	93.251	222.009	50.842	66.581
		98.023	426.33	59.767	88.8
BKCP	0	0	0	0	0
		0	0	0	0
BLCF	17	2.039	1.923	1.508	3.088
		1.653	3.846	1.476	4.842
BLGL	6	1.644	0	0.635	4.775
		1.524	0	1.27	3.993
BMBF	0	0	0	0	0
		0	0	0	0
BNMW	0	0	0	0	0
		0	0	0	0
BUSK*	**0**	**0**	**0**	**0**	**0**
		0	**0**	**0**	**0**
CARP	0	0	0	0	0
		0	0	0	0
CNCF	173	26.775	44.645	21.295	22.342
		16.143	60.172	19.431	11.247
ERSN	13	2.132	2.447	1.561	2.906
		1.456	3.492	1.884	3.326
FHCF	3	0.393	1.031	0.327	0
		0.435	1.203	0.654	0
FHMW	0	0	0	0	0
		0	0	0	0
FWDM	24	4.518	2.116	5.15	5.303
		3.989	2.482	7.108	7.203
GDEY	0	0	0	0	0
		0	0	0	0
GDSN	0	0	0	0	0
		0	0	0	0
GNSF	84	11.539	31.331	9.153	0
		15.351	57.998	17.719	0

Species	Total Catch	Overall CPUE	CHXO BAR	ISB BAR	OSB BAR
GSCP	0	0	0	0	0
		0	0	0	0
GZSD	1	0.154	0	0.309	0
		0.309	0	0.617	0
HBNS*	**0**	**0**	**0**	**0**	**0**
		0	**0**	**0**	**0**
LESF	0	0	0	0	0
		0	0	0	0
LMBS	0	0	0	0	0
		0	0	0	0
LNGR	0	0	0	0	0
		0	0	0	0
MQTF	0	0	0	0	0
		0	0	0	0
OSSF	0	0	0	0	0
		0	0	0	0
PDSG*	**0**	**0**	**0**	**0**	**0**
		0	**0**	**0**	**0**
PNMW*	**0**	**0**	**0**	**0**	**0**
		0	**0**	**0**	**0**
QLBK	0	0	0	0	0
		0	0	0	0
RDSN	47	8.544	0.463	9.226	13.783
		5.501	0.926	7.904	12.529
RVCS	39	5.406	11.58	4.949	1.29
		4.67	13.787	6.773	2.581
RVSN	0	0	0	0	0
		0	0	0	0
SGER*	**0**	**0**	**0**	**0**	**0**
		0	**0**	**0**	**0**
SHDR	0	0	0	0	0
		0	0	0	0
SHRH	0	0	0	0	0
SKCB*	**10**	**1.218**	**1.538**	**1.753**	**0**
		1.647	**3.077**	**3.062**	**0**

Species	Total Catch	Overall CPUE	CHXO BAR	ISB BAR	OSB BAR
SMBF	0	0	0	0	0
		0	0	0	0
SMMW	0	0	0	0	0
		0	0	0	0
SNGR	0	0	0	0	0
		0	0	0	0
SNPD	0	0	0	0	0
		0	0	0	0
SNSG*	**0**	**0**	**0**	**0**	**0**
		0	**0**	**0**	**0**
SNSN*	**8**	**1.102**	**0**	**2.205**	**0**
		1.669	**0**	**3.259**	**0**
STCT	0	0	0	0	0
		0	0	0	0
SVCB	5	1.058	0	1.19	1.667
		1.307	0	1.953	3.333
SVCP	0	0	0	0	0
		0	0	0	0
UCY	1	0.085	0.385	0	0
		0.171	0.769	0	0
UDR	1	0.159	0	0.317	0
		0.317	0	0.635	0
UHY	2	0.275	0	0.549	0
		0.384	0	0.743	0
UIC	1	0.121	0	0.242	0
		0.242	0	0.483	0
WTBS	0	0	0	0	0
		0	0	0	0
WTCP	0	0	0	0	0
		0	0	0	0
YLBH	0	0	0	0	0
		0	0	0	0
YOYF	0	0	0	0	0
		0	0	0	0

Appendix G. Hatchery names, locations, and abbreviations.

Hatchery	State	Abbreviation
Blind Pony State Fish Hatchery	MO	BYP
Neosho National Fish Hatchery	MO	NEO
Gavins Point National Fish Hatchery	SD	GAV
Garrison Dam National Fish Hatchery	ND	GAR
Miles City State Fish Hatchery	MT	MCH
Blue Water State Fish Hatchery	MT	BLU
Bozeman Fish Technology Center	MT	BFT
Fort Peck State Fish Hatchery	MT	FPH

Appendix H. Alphabetic list of Missouri River fishes with total catch-per-unit-effort by gear type for sturgeon season (fall through spring) and fish community season (summer) during 2006 – 2007 for segment 11, the Kansas River. Species codes are located in Appendix A. Asterisks and bold type denote targeted native Kansas and Missouri River species.

Species Code	**Sturgeon Season (Fall through Spring)**			**Fish Community Season (Summer)**			
	1 Inch Trammel Net	Gill Net	Otter Trawl	1 Inch Trammel Net	Mini-Fyke Net	Otter Trawl	Push Trawl
BHCP	0.031	0.016	0.000	0.000	0.000	0.000	0.000
BHMW	0.000	0.000	0.000	0.000	5.500	0.281	93.251
BKCP	0.000	0.000	0.000	0.000	0.083	0.000	0.000
BLCF	0.016	0.125	0.485	0.060	0.042	3.714	2.039
BLGL	0.000	0.000	0.018	0.000	1.583	0.000	1.644
BMBF	0.000	0.016	0.000	0.026	0.000	0.000	0.000
BNMW	0.000	0.000	0.000	0.000	0.083	0.000	0.000
BUSK*	0.066	0.375	0.000	0.031	0.000	0.000	0.000
CARP	0.000	0.125	0.000	0.000	0.208	0.025	0.000
CNCF	0.158	0.094	1.172	0.036	0.792	5.470	26.775
ERSN	0.000	0.000	0.850	0.000	2.583	0.000	2.132
FHCF	0.017	0.031	0.094	0.031	0.000	0.390	0.393
FHMW	0.000	0.000	0.000	0.000	0.125	0.000	0.000
FWDM	0.000	0.078	0.105	0.000	0.542	1.140	4.518
GDEY	0.000	0.328	0.000	0.159	0.000	0.000	0.000
GDSN	0.000	0.000	0.000	0.000	0.042	0.000	0.000
GNSF	0.000	0.000	0.000	0.000	2.333	0.000	11.539

Appendix H. (continued).

Species Code	Sturgeon Season (Fall through Spring)			Fish Community Season (Summer)			
	1 Inch Trammel Net	Gill Net	Otter Trawl	1 Inch Trammel Net	Mini-Fyke Net	Otter Trawl	Push Trawl
GSCP	0.028	0.016	0.000	0.000	0.000	0.000	0.000
GZSD	0.055	0.156	0.025	0.026	9.042	0.060	0.154
HBNS*	0.000	0.000	0.000	0.000	0.042	0.000	0.000
LESF	0.000	0.000	0.000	0.000	0.042	0.000	0.000
LMBS	0.000	0.000	0.000	0.000	1.083	0.000	0.000
LNGR	0.031	0.188	0.000	0.115	0.042	0.000	0.000
MQTF	0.000	0.000	0.000	0.000	1.333	0.000	0.000
NFSH	0.000	0.000	0.000	0.000	0.000	0.000	0.000
OSSF	0.000	0.000	0.000	0.000	0.417	0.000	0.000
PDSG*	0.000	0.016	0.000	0.000	0.000	0.000	0.000
PNMW*	0.000	0.000	0.000	0.000	0.125	0.000	0.000
QLBK	0.000	0.000	0.031	0.000	0.000	0.000	0.000
RDSN	0.000	0.000	0.034	0.000	37.958	0.037	8.544
RVCS	0.020	0.063	0.054	0.237	6.625	0.045	5.406
RVSN	0.000	0.000	0.000	0.000	0.458	0.000	0.000
SGER*	0.020	0.016	0.000	0.031	0.000	0.000	0.000
SHDR	0.000	0.000	0.017	0.000	0.000	0.000	0.000
SHRH	0.000	0.000	0.032	0.029	0.000	0.000	0.000
SKCB*	**0.000**	**0.000**	**0.053**	**0.000**	**0.000**	**0.097**	**1.218**

Appendix H. (continued).

Species Code	Sturgeon Season (Fall through Spring)			Fish Community Season (Summer)			
	1 Inch Trammel Net	Gill Net	Otter Trawl	1 Inch Trammel Net	Mini-Fyke Net	Otter Trawl	Push Trawl
SMBF	0.102	0.453	0.010	0.263	0.000	0.020	0.000
SMMW	0.000	0.000	0.000	0.000	0.125	0.000	0.000
SNGR	0.000	0.000	0.000	0.031	0.583	0.000	0.000
SNPD	0.000	0.031	0.000	0.000	0.000	0.000	0.000
SNSG*	1.872	6.531	0.433	1.540	0.000	0.336	0.000
SNSN*	0.000	0.000	0.084	0.000	7.708	0.053	1.102
STCT	0.000	0.000	0.028	0.000	0.083	0.000	0.000
SVCB	0.000	0.000	0.309	0.000	0.375	0.412	1.058
SVCP	0.056	0.047	0.000	0.033	0.000	0.000	0.000
UCY	0.000	0.000	0.000	0.000	0.000	0.000	0.085
UDR	0.000	0.000	0.000	0.000	0.000	0.000	0.159
UHY	0.000	0.000	0.000	0.000	0.000	0.060	0.275
UIC	0.000	0.000	0.000	0.000	0.083	0.000	0.121
WTBS	0.000	0.031	0.000	0.000	0.333	0.000	0.000
WTCP	0.000	0.078	0.000	0.000	0.667	0.000	0.000
YLBH	0.000	0.000	0.000	0.000	0.042	0.000	0.000
YOYF	0.000	0.000	0.000	0.000	0.042	0.000	0.000

Appendix I. Comprehensive list of bend numbers and locations for segment 11, the Kansas River, comparing bend selection for both sturgeon season (ST) and fish community season (FCS) between years from 2006 – 2007.

Bend Number	Bend River Mile	Coordinates*		2003	2004	2005	2006	2007
		Latitude	Longitude					
1	1.7	39.09375	-94.60988					
2	5.0	39.07892	-94.65139					ST, FCS
3	9.0	39.09493	-94.70882				ST, FCS	
4	12.0	39.07377	-94.75377					ST, FCS
5	14.7	39.04654	-94.78568					
6	21.0	39.04406	-94.88401					ST, FCS

* Coordinates represent the upper most point of the bend (i.e., the top of the bend going upstream).